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Tennessee Valley Health Program

E. L. BISHOP

Vaccination Against Tuberculosis

J. A. BAUDOUIN

Problems of Poliomyelitis

J. CRAIGIE

Public Health Education

GORDON BATES

Stillbirth Statistics

E. S. MACPHAIL

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The Health Program of the Tennessee Valley Authority*

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THE Act of Congress creating the Tennessee Valley Authority has the following preamble:

> To improve the navigability and to provide for the flood control of the Tennessee River; to provide for reforestation and the use of marginal lands in the Tennessee Valley; to provide for the agricultural and industrial development of said valley; to provide for the national defense by the creation of a corporation for the operation of Government properties at and near Muscle Shoals in the State of Alabama, and for other purposes.

The immediate operations of the Authority lie within the watershed of the Tennessee River—40,600 square miles of territory. It embraces parts of seven states—Tennessee, Kentucky, Virginia, North Carolina, Mississippi, Alabama and Georgia. Two million people live within the Valley, and another 4,000,000 in contiguous territory directly affected by the conditions which may be prevalent in the valley.

Briefly the work of the Authority may be grouped into a few classifications:

1. *Construction*

Five dams are now being built. One—Wilson Dam—was turned over to the Authority complete. Other dams are in contemplation. The five under construction are Norris Dam, a storage plant located in the Cumberland foothills near Knoxville; and Wheeler, Pickwick Landing, Guntersville, and Chickawauga dams on the Tennessee River. The purposes of these dams and others to come are to eliminate floods, provide adequate navigation, and to prevent the waste of the tremendous energy of the stream by converting it into electricity.

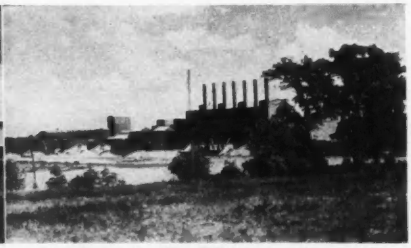
2. *Proper Land Use*

This phase of the program embraces

**Presented by Reginald M. Atwater, M.D., at the National Conference of the Canadian Public Health Association with the Canadian Tuberculosis Association, the Ontario Health Officers' Association, and the Canadian Social Hygiene Council, Toronto, June, 1935.*

an attack on soil erosion so that the reservoir investment of the government will not be wiped out and navigation impeded by silting, and so that the land of the farmers in the Valley may be saved. It calls for the restoration of forests to their proper condition, to the terracing of agricultural land where needed. It calls for demonstrations and experiments leading to production and distribution of new and better forms of plant food. The Authority at this time is concentrating on the development of a proper phosphate fertilizer, so sorely needed by soil of the south and elsewhere. I will not attempt in this address to go into details of this important phase of the Authority's operations.

A view of downstream face of Wheeler Dam from the south abutment. The power house section is in the foreground. TVA project.



A view of the TVA's experimental Phosphate fertilizer plant at Nitrate Plant No. 2.

3. National Defense

The act makes it mandatory upon the Authority to keep the Muscle Shoals plants in stand-by condition in the event of emergency.

4. Power

The act grants to the Authority the right to dispose of surplus power, generated as a by-product from its dams. This power the Authority is now selling to cities and counties which resell it at TVA low rates to homes, farms, and industries in the Valley. In all places where TVA power is being sold the consumption has strikingly increased while the cost to the consumer has been reduced.

HEALTH AND MEDICAL SERVICE

Administration of Health and Medical Service of the Authority is being developed with the following three basic essentials constantly in mind:

(1) Necessary service to employees of the Authority.

(2) Health and sanitation service in the immediate territory of areas where major operations are in progress.

(3) Needs arising from a change in conditions as a result of operations by the Authority or in connection with its major objectives.

In the first category fall such activities as physical classification of employees, first aid and immediate medical care of injured employees, emergency medical service and similar responsibilities.

In the second group come such activities as venereal disease control, general supervision of water and food supplies, and environmental sanitation.

The third group includes the problems of industrial hygiene, stream sanitation, malaria control, and in fact a wide variety of adjustments to changing environment and circumstances.

The principles guiding the development and administration of projects are:

(1) Each project must be related to necessities falling in one or more of the foregoing categories.

(2) Direct service projects must be developed only when

(a) Related to one or both of the first two classes of basic essentials, and
(b) No other facilities are available through which responsibilities may be met.

(3) Wherever and whenever possible, projects must be developed through or with the cooperation of existing agencies or organizations and existing facilities must be fully utilized. This is imperative to the prevention of service duplication and unnecessary costs, is more effective and has the added advantage of strengthening present organizations. In the development of an organization a small central service staff of experienced individuals has been recruited to serve as the administrative and consultation facility. Field personnel is recruited from younger age groups, each individual being selected with reference to excellence of basic training and potential development. Groups of consultants in the more technical fields are being secured from the best talent available. In this fashion it is expected that the energy and modern training of youth may be tempered and guided by judgment and experience.

A view of the upstream face of Norris Dam from the mixing plant on the west abutment. TVA project.

One of the medical units set up in the Norris Dam reservoir area. These units serve the workers on reservoir clearance. TVA project.

Medical Service

Medical service provided in the work of the Authority is responsible for examination and classification according to physical status of all applicants for employment; aid in placement of all employment; aid in placement of all employees with partial physical disability to positions in which adjustments are practicable; provision for direct medical care to all employees injured in line of duty until responsibility is assumed by the Federal Compensation Commission; emergency medical care for employees away from their natural residence; essential immunization services for all employees; a program for the control of venereal diseases through prophylaxis, and treatment, supplemented by the training and recreational facilities provided through other sections of the Personnel Division; and the clearing of all compensation claims originating from employees of the Authority.

Health and Sanitation Service

Health and sanitation service may be discussed under two general headings, first, that which is concerned with present activity, and second, that which relates to projects under consideration for early development.

We are at present extending cooperation and financial aid to strengthen and develop full-time health service in certain local health departments within the Valley, the immediate objective being to supply health protection to our own population groups working or resident in these areas. The ultimate objective, of course, is the strengthening and stabilization of local health work with the view to

fortification of our first line defense and the creation of a second line of defense in the control of problems arising from operations of the Authority or in connection with its major objectives. Quite obviously this work is being developed through the State Health Departments and by such co-operation we have been able to provide services for which we are immediately responsible at much smaller cost and in a much more effective manner than had we set up independent establishments. Moreover, the co-operative program has aided local governments in providing more extensive service for the population as a whole, thus tending to stabilize the local health program throughout the Valley. Projects of this kind are now in effect in sixteen counties of three states and will be extended as the major operations of the Authority require the addition of new areas.

Aeroplane dusting on Wilson Dam lake. This dusting with paris green is part of the TVA's malaria control program.

Air view of Wilson Dam and power house. This dam is now operated by the TVA.

In addition to the co-operative health work, our own medical officers and engineers must exercise general supervision over water supplies, sewage disposal, milk and food, and miscellaneous features of community sanitation in the areas directly under the administration of the Authority. This work has been related to one of our largest and most important problems, namely, malaria control, which is a service project of the Authority itself, essentially concerned directly with its program of impoundage. In this problem as in health and sanitation matters generally we are integrating activity of two main fields of service, first, that concerned with independent operations, including mosquito control on shore lines of our own reservoirs and the mile zones around these shore lines, and second, co-operative control work which in effect means co-ordination of resources of the Authority and those of the State and local health departments of the area.

No more important problem faces the Authority in regard to vital resources of a considerable section of the Valley than malaria. This disease, the devitalizing effect of which is out of all proportion to its case fatality, can work and has worked havoc of major importance to the economy of a people. It is now in retreat, the South constituting the principal remaining endemic area of the Continental United States. Impoundage of large bodies of waters with long irregular shore line reverses, to a degree, the forces that have produced recession of endemic prevalence. To prevent probable disaster, knowledge of infection rates, prevalence and distribution of clinical cases, and the distribution of Anophelene mosquitoes, their natural enemies and antagonistic elements, must be acquired through tedious and continuing studies. Parallel to such work must go studies of new or modified control procedures in an effort to reduce costs, for, to be effective, prevention must be within the reach of available resources.

In order that the best available talent can be brought to bear upon these matters a group of four consul-

tants formed from the outstanding authorities of the country has been organized as a critical review facility of our staff and to advise our engineers and malariologist.

Last, but by no means least, in the program of present activity is the matter of health education. A small project just recently approved provides for co-operation with the University of Tennessee, the State Health Department, and the State Department of Education in the training of personnel for health education work. A broad, and to some extent a new, approach is contemplated in this but poorly developed service, its object being not only to secure application of existing knowledge but also to prepare certain population groups for new situations—for example, malaria prevention.

Projects under consideration for development in the relatively near future include industrial hygiene, stream sanitation, and definitive study of public health problems and situations within the Valley area.

There is need for the early development of a program of industrial hygiene which would have for its immediate objective hygienic control of industrial environment for the employees of the Authority. When and if such work is developed, it will include not only potential special industrial hazards, for example, dust in the experimental manufacture of phosphate fertilizer, but also general environmental circumstances affecting the welfare and efficiency of clerical and staff employees. Through the co-operation of the U.S. Public Health Service certain of its phases are now being studied to determine the extent of special hazards at Wilson Dam.

The problem of stream pollution is important from the standpoint of developing industry throughout the Valley. It is related to the potability of water supplies, the conservation of soil, fish and other life, and, in certain instances, it may have an influence upon navigation and re-use of water in other industries. Encouragement and stimulation of special researches into the problem, the contribution of consultant services and expert technical knowledge not otherwise obtainable by existing health agencies with a view of developing a co-ordinated plan of stream sanitation throughout the Valley would appear to be logical endeavors for the Authority.

Finally, with regard to the study of public health problems, it would seem that any program concerned with public health and sanitation must depend for effectiveness upon study of the many and varied public health conditions and resolution of these conditions into the most specific terms possible. The Tennessee Valley area includes parts of seven states. Statistical data on public health situations are limited and those that are available are usually set up for states as geographical units. In order to obtain specific material for the Valley as a whole, these data must be analyzed in terms of county and local units, then reassembled for the area as a whole. This work we expect to do through the services of the administrative staff.

A rather wide variety of both general and special problems having direct or indirect interest could be quickly assembled for consideration. Such problems would fall naturally into two general classes—the first of an epidemiological character and the second, administrative. Ultimately these problems must be given serious thought, but for the present the seriousness of projects presenting for immediate solution is such as to preclude other than casual consideration. Nevertheless the Authority is in a unique position to contribute to the solution of a variety of situations, for it can bring to bear upon these problems not only the necessary facilities from the field of public health but facilities from collateral fields which in the end will probably contribute as largely to successful solution as will facilities from the specialized fields in health and sanitation.

Some Problems of Poliomyelitis*

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FROM a public health point of view, the problem of poliomyelitis is the problem of any other infectious disease; that is, its prevention. I am not, however, going to discuss this aspect alone, for there are other problems which have a highly important bearing on the one in which we are primarily interested. These problems may be indicated by three questions:

(1) What is the nature of poliomyelitic infection in man?
(2) What is the nature of immunity to poliomyelitis virus?
(3) Can poliomyelitis be prevented?

Before considering these questions, let me sum up briefly the established facts relating to the virus and the disease which are relevant to the discussion.

The causal agent of poliomyelitis is one of the smallest known viruses. The only viruses known to rival or exceed it in minuteness are those of yellow fever and foot and mouth disease. It is larger than $8\mu\mu$ and smaller than $15\mu\mu$; that is, somewhere about half a millionth of an inch. Like all viruses, this virus cannot be grown on a lifeless medium. Not only are the cultural methods of bacteriology not available for its study, but only one susceptible animal is known. In this animal, the monkey, the histopathology of the infection resembles that in man. The monkey is most readily infected by intracerebral inoculation of the virus. It is readily infected by intranasal instillation of the virus, particularly after lavage of the nasal passages with an acid buffer solution.[1] Very large, indeed overwhelming, amounts of virus are required to infect the monkey by the intradermal, subcutaneous and intravenous routes, and it cannot be infected by the alimentary canal unless the intestinal wall has been so grossly damaged as to favour contact with nerve fibres.

In the monkey, the virus travels along the nerve fibres and by definite neural tracts. This has been clearly demonstrated by the work of Fairbrother and Hurst,[2] Faber and Gebhardt,[3] and other investigators. After intranasal instillation the virus travels along the olfactory nerves to the olfactory bulb. If the olfactory nerves are previously cut,[4] the animal becomes resistant to intranasal inoculation without loss of its susceptibility to intracerebral inoculation. The virus pursues a definite path along nerve tracts[5] and finally reaches the anterior horn cells when the culminating paralysis is produced. In the infected human being or monkey, the virus is practically confined to the central nervous system and the cord, medulla and midbrain account for over 90 per cent of the virus in the central nervous system. The only other situation from which it has been recovered with regularity is the nasopharynx. It is of particular interest that the virus has never been found in the blood or cerebrospinal fluid of human cases. It has been found in the blood of the monkey only after overwhelming doses.

If the human being or monkey survives the infection, the blood serum develops the property of neutralizing the virus. The neutralization test is carried out by mixing the serum with a suitable amount of infective cord suspension *in vitro* and, after a period,

**Presented at the National Conference of the Canadian Public Health Association, the Ontario Health Officers' Association, and the Canadian Social Hygiene Council, Toronto, June, 1935.*

injecting the mixture intracerebrally in the monkey. The presence of neutralizing antibody renders the mixture non-infective.

Following infection the individual or monkey becomes resistant to reinfection. This immunity, however, is not dependent on neutralizing antibody, or rather, this antibody is not the explanation of the immunity. It has recently been shown by two groups of workers that inactivated poliomyelitis virus, in one case adsorbed on aluminium hydroxide[6] and in the other, treated with formalin,[7] produced neutralizing antibody in monkeys without decreasing their susceptibility to intranasal or intracerebral inoculation. We also know that antibodies for some other viruses may neutralize or mask the virus without necessarily killing it and that under certain conditions infective virus may be recovered readily from neutralized suspensions. All that can be said with certainty about poliomyelitis neutralizing antibody is that when mixed with the virus, the virus in the mixture is unable to produce infection and that the presence of this antibody in human serum, provided that virus in the form of a vaccine has not been administered, is presumptive evidence of co-existing immunity. This last statement is based on the belief that the antibody is specific and produced only after clinical or subclinical infection with the virus. I shall return to this point later.

Most viruses, when transferred to an experimental host which they do not infect in nature, show changes due either to the mode of inoculation and transfer adopted or in response to the novel environment of the alien host. There is suggestive evidence that poliomyelitis may do so. A recently isolated strain requires a number of transfers to establish it in the monkey and some may die out during the early transfers. Experimental work is usually carried out with a few well studied and established strains. The effect of repeated transfers in the monkey in some respects might be likened to the fixation of rabies virus for the rabbit. Several workers have brought forward evidence that old monkey strains differ to some extent immunologically from recent human strains. Paul and Trask[8] have recently reported observations on this. Recovered monkeys showed a less lasting immunity to recent human strains than the strain with which they had first been infected. These workers, therefore, suggest that the titration of poliomyelitis serum for treatment should be undertaken with recent human virus instead of an old monkey strain.

If monkeys are inoculated intradermally with poliomyelitis virus, some may, without developing signs of clinical infection, become immune. Immunity without clinical infection may also follow subcutaneous infection but it is more irregular and infection may result. It is a very interesting fact that the monkey cannot be immunized by the intracerebral route without clinical infection. If the amount of virus injected fails to produce infection, no immunity results. Indeed, if a monkey shows no sign of infection after intracerebral inoculation, it is the practice to regard and to use it as being as susceptible as a normal monkey.

WHAT IS THE NATURE OF THE DISEASE IN MAN?

In the monkey the virus behaves as a strict neurotropic virus. That is, it has a specific affinity for nerve cells. It is not found apart from nerve tissues except in the nasopharyngeal mucosa where its presence can be explained by spread outwards along nerve fibres from the central nervous system. The only type of cell in which the virus can multiply and cause symptoms is the nerve cell. If it causes infection in the monkey after inoculation not made directly into the central nervous system, it reaches this system by centripetal passage along nerve fibres. In this way, poliomyelitis virus behaves in the monkey in the same way as rabies virus and herpes simplex

virus, after loss of its skin affinity, in the rabbit.

Draper took the view that poliomyelitis in man was a generalized infection in which paralysis was only an incidental and accidental occurrence. The virus, having gained the blood stream, penetrated in some cases the choriomeningeal barrier, gained the cerebro-spinal fluid and thence the brain and cord. Against this view is the fact that the virus has never been recovered from the blood or cerebro-spinal fluid of human cases. Faber[9] reviewed the disease in man in the light of experimental work on the distribution and mode of spread of the virus in the monkey, and referred the clinical signs and symptoms at various stages to infection of the thalamus, medulla and cord successively, following entry of the virus via the olfactory hairs. In other words, he regards the infection in man as being strictly analogous to the experimental infection in the monkey. The only difference is that in man the virus shows a greater tendency to halting. It is held up at points along its neural path; possibly the synapses are an important potential barrier. Immunity results when the virus is held up early in its course; perhaps it may progress no further than the olfactory bulb. Faber does not explore the question of immunity further and we shall see in a moment whither further consideration of this might lead us. Many physicians will dissent from Faber's view. The point of whether the virus in man is confined to the central nervous system or not is highly controversial because the symptomatology is open to two interpretations. The laboratory evidence—the strict neurotropism of the virus in the monkey and the failures to isolate it from the blood, cerebro-spinal fluid, and other tissues of human cases—lends support to Faber's views. We leave the question of the nature of the disease in man as an unsolved problem. It is unfortunate, for the answer would shed light on the two problems which remain to be considered.

What is the Nature of Immunity to Poliomyelitis in Man?

The most widely accepted hypothesis regarding the acquisition of immunity to poliomyelitis is the "theory of latent immunization." This theory states (1) that the virus is extensively distributed and that the chances of contact with the virus are therefore frequent, (2) that the virus is transferred from person to person by droplet infection, (3) that the innate resistance of most individuals is high, (4) that infection and disease are not identical. Disease, and particularly disease progressing to paralysis, follows infection only in exceptional cases; those infected without the development of clinical disease in virtue of their innate, non-specific resistance, lay the foundation of a specific acquired immunity which is consolidated, if it should be necessary, by subsequent exposures to the virus.

This theory gives an adequate explanation of the difficulties of tracing contact between cases unless circumstances are extremely favourable, and of the epidemiological differences between poliomyelitis and the more common droplet infections. It also stresses the importance of healthy carriers in the dissemination of the virus and the importance of innate resistance of the central nervous system to the infection. It gives an explanation of the increasing proportion of individuals who possess neutralizing antibody as age increases. It is true that some workers doubt the specificity of poliomyelitis neutralizing antibody (and other antibodies as well) and have brought forward a theory of physiological maturation of antibodies as opposed to antibody formation as a result of specific infection. The evidence does not appear to be convincing. More weight may possibly be attached to maturation theories which simply postulate an increase of non-specific resistance with age. Non-specific resistance may be resistance on the part of the neurones or the resistance of some barrier, such as the

nasal mucosa, which the virus has to penetrate to reach nerve fibres or cells. The theory of latent immunization does not, however, reach down to the fundamental questions of immunity which have a bearing, on the one hand, on the nature of the infection in man and, on the other, of serum treatment and active and passive prophylaxis of the disease. Is immunity to poliomyelitis chiefly cellular or humoral in nature? In other words, does immunity depend on resistance of the susceptible nerve cell to infection or upon antibodies in the blood and body fluids which prevent the virus from invading the cell or passing from one neurone to the next across the synapse? In the disease in the monkey there may be, at first sight, something to be said for the cellular type of immunity since the virus here is strictly a parasite of nerve cells and neutralizing antibody administered after infection and before clinical manifestations, or preformed in the monkey by means of an inactivated vaccine, does not restrain the infection. On the other hand, the investigation of a number of viruses by tissue culture methods indicates that immunity is predominantly humoral and not cellular. The failure of monkeys to develop immunity after the repeated injection, directly into nerve tissue by intracerebral inoculation, of doses of virus just a fraction less than the minimal infective dose, while they can be rendered immune without clinical infection after intradermal injection of the virus, might seem to be an argument for the importance of humoral immunity to this virus.

The failure of subinfective intracerebral doses to produce immunity argues against the acquisition of cellular immunity on the part of the nerve cells by the constant migration of minute amounts of virus from the intradermal depot of virus to the central nervous system. The non-immunizing value of subinfective intracerebral injections is explicable on the basis of the small amount of seed required to set up infection when it is introduced into the highly susceptible nervous tissue. The small amount of virus contained in the intracerebral inoculum is possibly too small to act as an antigenic stimulus while that introduced intradermally is adequate to do so.

Except for the disturbing fact that inactivated virus produces neutralizing antibody without concomitant immunity in the monkey, the probability appears to be that immunity to this virus is predominantly humoral. The difficulty which I have just referred to could be met by the hypothesis that poliomyelitis virus is not a simple antigen, but that like vaccine virus it has, in addition to an antigen which survives inactivation of the virus, a hyperlabile antigen susceptible to inactivation by measures which inactivate the virus. Inactivated poliomyelitis virus may be able to produce only one type of antibody which, although it neutralizes if brought into contact with the virus first *in vitro,* is not efficient in the *in vivo* limitation of the virus.

Having failed to reach any definite conclusion regarding the nature of immunity to poliomyelitis in the monkey, let us turn to the question of immunity in the human being. There is an added complication here since we are uncertain of the nature of the disease in man. If poliomyelitis virus is strictly neurotropic in man as it is in the monkey, then immunity can arise only as a result of penetration of virus into the nerve tissue, for it seems most unlikely that immunity could arise from parenteral absorption of the minute amounts of virus which would be implanted on the respiratory mucosa in the course of natural contact. The frequency of the acquisition of immunity and of neutralizing antibody without clinical signs of infection argues against the hypothesis advocated by Faber, that of strict neurotropism of the virus in man. If Faber's view, because of this, is not acceptable, then since the view championed by Draper has definite evidence against

it, we are left without a hypothesis. Can a hypothesis consistent with the available facts be elaborated, if we draw suggestions from the virus field in general?

The main facts which an acceptable hypothesis must take cognisance of are (1) increasing insusceptibility with age, (2) the amount of neutralizing antibody usually present in the serum of adults who have never had the disease, (3) the frequency of abortive cases and the clinical features of all types of cases, and (4) the reported failures of serum prophylaxis and treatment. A hybrid hypothesis, consisting largely of the more acceptable portions of Faber's and of Draper's views appears to meet the requirements. There is not, I regret, time at my disposal to develop it logically, or to indicate the observations on other viruses on which I draw.

Many viruses show a combination of neurotropic and viscerotropic affinities. The best known example, perhaps, is yellow fever virus. In the disease, its neurotropic qualities (affinity for the central nervous system) is obscured by its proliferation and lethal effect on cells of viscera such as the liver. Transfer through the brains of mice selectively enhances the neurotropic affinities of the virus and suppresses its viscerotropic affinities. This modified virus produces encephalitis if introduced into the brain of two species of monkeys; so does the unmodified viscerotropic form. The modified form by other routes produces immunity with neutralizing antibody with modified or absent symptoms. The unmodified behaves similarly in one species—the African green monkey—but produces a severe and fatal visceral infection in the macacus rhesus monkey.

Poliomyelitis virus in man may, conceivably, show a dual tissue affinity similar to many other viruses. Viscerotropically, however, it must be a benign invader, while it receives an opportunity to show its neurotropic qualities in comparatively few individuals. If it invades the central nervous system, it does so, not from the blood stream, but from the same point as it invades the body generally, that is, the nasal mucosa. There is not necessarily any symptomatology connected with the invasion of the body generally, but such invasion leads to the development of immunity.

According to this hypothesis of dual tissue affinity of poliomyelitis virus in man, there are several possibilities when the virus, for the first time in the individual's experience, is implanted on the nasal mucosa. If the barrier of the nasal mucosa remains intact and the virus silently, or perhaps with mild symptoms, invades the body, immunity with the formation of some neutralizing antibody will result. When such an individual receives a further dose of virus this immunity will enhance the effectiveness of the non-specific barrier to the central nervous system. Under exceptional circumstances and when proliferating to an unusual extent in some part of the body, the virus may strike nerve fibres and then travel centrifugally to the central nervous system by some route other than the orthodox olfactory pathway. Visceral invasion may occur but before immunity becomes effective the nasal barrier may break down and invasion of the central nervous system occurs. Having invaded the central nervous system the virus travels as it does in the monkey to the anterior horn cells, or it may be brought to a halt at any point on the neural pathway either because of resistance of the neurones or by the development of effective immunity which was stimulated by the prior visceral invasion.

The absence of demonstrable virus from the blood of cases is not an objection to this hypothesis which postulates a minimal or absent symptomatology referable to the visceral invasion and infection of the central nervous system, not from the blood stream, but by centripetal axonal propagation of the virus. In any case failure to re-

cover virus from blood does not mean that it must be absent therefrom. It may be present in too minute a quantity for successful transfer to the monkey or may be masked by the presence of traces of neutralizing antibody.

CAN MAN BE SUCCESSFULLY IMMUNIZED AGAINST POLIOMYELITIS?

The production of temporary passive immunity by the injection of immune serum may be briefly dismissed in view of its striking failure in the epidemic of South California, last year. One hundred and fifteen members of the staff of the Communicable Diseases Unit of the Los Angeles County Hospital developed poliomyelitis. Of these, sixty-one or 59 per cent developed poliomyelitis. In this connection, however, the possible influence of fatigue in offsetting any protective qualities the serum might have had, the possibility of greater exposure among those receiving serum, and the suggestion that an established monkey strain is not an adequate test for serum which is to be used therapeutically or prophylactically in man, should be borne in mind.

Two types of vaccine have been proposed for the active immunization of human beings against poliomyelitis. One is a suspension of infective monkey cord, the virus in which has been presumably inactivated by means of formalin. The other is infective cord suspension the virus in which has been attenuated, but not rendered noninfective for the monkey, by means of sodium ricinoleate. The evidence that has been brought forward in support of these vaccines is of two kinds: the development of neutralizing antibody in monkeys and human beings injected with the vaccine and the resistance of vaccinated monkeys to injection with the virus.

We have seen that inactivated poliomyelitis virus will lead to the production of neutralizing antibody in the monkey without immunity to intranasal or intracerebral inoculation of the virus. Development of this antibody in man after vaccine administration therefore cannot be taken as an indication of the development of immunity. In one paper Brodie expressed the immunity of monkeys receiving formalized vaccine as resistance to an average of 1.7 minimum complete paralysing doses. This fractional decrease in susceptibility does not appear to be significant. Others have had even less success. On the other hand, the attenuated vaccine employed by Kolmer does produce a satisfactory degree of immunity in monkeys but this author, again, lays stress on the production of neutralizing antibody in human beings by the vaccine. Even though the virus in the vaccine retains some infectivity for the monkey, it does not follow that after attenuation it can produce immunity on return to its original host after prolonged passage on the monkey.

The attenuated type of vaccine is much more likely to produce immunity than the inactivated type of vaccine but the only proof that either is effective will be forthcoming only when an adequate number of vaccinated children are exposed to infection. There is, unfortunately, no method of determining whether a person is susceptible to poliomyelitis. To obtain definite information regarding the efficacy of a poliomyelitis vaccine it would be necessary therefore to vaccinate a very large group of children. Let us take the generally most susceptible group —that under 5 years of age. In order to obtain 100 vaccinated susceptibles in this group it would be necessary to vaccinate 10,000 to 50,000 children under 5 years of age. This calculation is based on case incidence during an epidemic of considerable severity. At the same time we would have to arrange to leave an equal and similar group unvaccinated. The occurrence of sporadic cases in the control group only would be suggestive but convincing results could be obtained only if an epidemic occurred. If the test epidemic did not occur for several years,

then with the passage of time an increasing number of the 100 vaccinated susceptibles would have the opportunity of acquiring immunity in the natural way.

Obviously a considerable period must elapse before any definite assurance that a poliomyelitis vaccine is efficacious will be forthcoming. Meanwhile, there is another aspect of the question for the more timid of us, where attenuated vaccine is concerned. Is it entirely free from risk? Of children under 5 years of age, several hundred will have to receive vaccine in order to be certain of vaccinating one susceptible child. Many therefore must be vaccinated before we can feel assured that the vaccine will not produce infection in the very type of individual it is designed to protect.

If we were in a position to answer the other questions I have referred to, we might on *a priori* grounds form a more definite opinion as to whether a poliomyelitis vaccine is on the one hand innocuous and on the other likely to give rise to an adequate degree of protection. As it is, the administration of poliomyelitis vaccine is an experimental procedure and some considerable time must elapse before any evidence of the efficacy of the measure in the face of exposure to sporadic or epidemic poliomyelitis will be forthcoming.

In conclusion I would like to draw attention again to the question of nonspecific resistance to poliomyelitis. That it is an extremely important factor in permitting natural immunization is unquestionable. Suppose that we were certain that the virus always entered the nervous system through the olfactory tract and that the nasal mucosa was a more important barrier than the neurones and synapses. Would the question of the control of poliomyelitis not then become the question of how to enhance this barrier without interfering with the natural development of immunity?

REFERENCES

1. Schultz, E. W., and Gebhardt, L. P., *Proc. Soc. Exper. Biol. & Med.*, 1933, **30**: 1010.
2. Fairbrother, R. W., and Hurst, E. W., *J. Path. & Bact.*, 1930, **33**: 17.
3. Faber, H. K., and Gebhardt, L. P., *J. Exper. Med.*, 1933, **57**: 933.
4. Schultz, E. W., and Gebhardt, L. P., *Proc. Soc. Exper. Biol. & Med.*, 1934, **31**: 728.
5. Faber, H. K., and Gebhardt, L. P., *J. Exper. Med.*, 1933, **57**: 933.
6. Gordon, F. B., Harrison, J. A., and Hudson, N. P., *J. Bact.*, 1935, **29**: 62.
7. Schultz, E. W., and Gebhardt, L. P., *California & West. Med.*, 1935, **43**, No. 2.
8. Paul, J. R., and Trask, J. D., *J. Exper. Med.*, 1933, **58**: 513.
9. Faber, H. K., *Medicine*, 1933, **12**: 84.

Public Health Education and National Health*

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THE education of the public in the methods which may be used to keep well has in a sense become a popular crusade during recent years. Medical writers or near-medical writers or pseudo-medical writers have attacked the problem with an enthusiasm born in some cases of sincerity and a desire to serve the public weal and in others of a desire to replenish a too flat pocket-book.

We are all aware of the value of publicity to the charlatan who desires to sell his wares. Unquestionably this type of publicity has done a great deal of harm and for a long time the medical profession, obsessed I think with a false conception of ethics, felt that it was unwise or undignified to make a definite attempt to keep the public from straying into the paths of error even by the simple procedure of pointing out to them the truth in connection with the solution of many medical problems of a personal character.

I think that to a certain extent that day has passed and now considerable public health education of a legitimate character is being carried on through the press and by other means which may be calculated to do a great deal of good. I think that there is no doubt that while so-called ethical considerations have been a hindrance in many directions in the past, the main consideration to-day on the whole is held to be the greatest good of the greatest number. Hence a welcome broadening in the attitude of the medical profession, welcome because the result of the spreading of legitimate education by means of the speaker, the pamphlet, or radio must have its effect in lowering death rates quite as much as similar publicity promulgated by fanatics, sincere or insincere, probably does infinite harm.

Development of a Community Conscience in Health Matters

The value of education in the public health field is, of course, obvious to any student and it seems to me that an even greater recognition of its significance is essential to the progress of the general movement towards a reduction in sickness and mortality rates.

Probably the first person to recognize the importance of education is the health officer who, having developed a preventive point of view (a view to develop much more slowly in the minds of his brethren of the clinic and even the laboratory), finds himself confronted with the fact that he cannot enforce public health laws, that he cannot persuade people to be inoculated or vaccinated, that he cannot induce them to assist him in purifying their food or water supplies because of ignorance. Hence the health officer was the first to insist upon the futility of public health endeavour unless education is recognized as one of the greatest factors in the success of a public health program. I need not discuss here the importance of the health bulletin as issued by departments of health, nor of the constant reiteration of important truths by the health officer through whatever medium he chooses, except to say that the health officer who does not recognize the fact that education is of

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great importance and who does not act accordingly is not an efficient health officer.

It is not my object in this paper to discuss in detail any specific method which may be utilized, either by departments of health, by medical organizations, or by voluntary health associations. Their name is myriad. The press article, the pamphlet, the exhibit at a country fair, the poster, the moving-picture, the radio address, the stereoptican slide, these are all measures of which we know in a general way, the extent to which they are used depending upon the alertness and farsightedness of the particular person or health organization concerned. Doubtless the intensive use of such means as these on a widespread scale by health departments alone would, if it were practicable, have a profound effect upon the health conscience of the individual, certainly as regards the welfare of himself and his immediate family. The question as to how far such measures may be calculated to develop a community conscience is, I think, a little more difficult. I suggest that the development of a community conscience in health matters is of great importance, and that it depends upon the recognition of considerations which many of us tend to forget.

The problems of sickness and health have more than a personal significance. They have a social significance and an economic significance. The country with the highest sickness rate and the highest mortality rate is probably at the most a backward country.

If we allow our babies to die for the lack of clean milk or because our mothers do not feed them properly, if we allow our adults to develop syphilis, tuberculosis, or typhoid, by our neglect we retard economic and social progress. Similarly, if instead of running into debt to build hospitals and asylums, because of an adequate community conscience we adequately support our health departments, train our physicians in preventive medicine, and keep our citizens alive to the need of spending money as it should be spent to conserve health, by so doing we speed up economic and social progress. The backward countries are the countries in which tuberculosis, syphilis, and high infant mortality rates go hand in hand with illiteracy and slums, and vice versa. A stock example of the effect of a public health campaign upon economic and commercial progress is the building of the Panama Canal. Every school child to-day knows, and if he does not know he should be taught, that while the white labourers of De Lesseps, first engineer of the Panama Canal, died and while his engines were left rusting by the side of the half-finished ditch because of the devastating effects of malaria and yellow fever, Goethals, the engineer, completed the canal because of the contribution of Gorgas, the health officer, who eliminated these tropical plagues by simple sanitary expedients.

The elimination of unnecessary disease and death resulting in the completion of the Panama Canal proved conclusively the relationship between good health and social and economic progress as applied to a community.

It would seem that in spite of this clear-cut relationship health officials have been slow to recognize its significance, with the result that although they may be imbued with the need for public health education in the ordinary sense they find themselves unable to procure sufficient budgets for other work which they know should be done, as well as for ordinary administration, and still wonder why.

I think I can say without fear of successful contradiction that public health has as yet no political significance. Certainly this statement is true in Canada, and I suggest here that the reason is our failure to recognize the importance of the connection between death rates and business,

between expensive hospitals and unnecessary waste, between badly financed departments of health and hence high, costly sickness rates and our consequent failure to hammer the facts into the minds and consciousness of the average man who votes, elects, and is elected to our municipal councils, our legislative assemblies, and our Dominion Parliament.

I suggest that this is necessary because the average man who is as yet unaware of the significance of community health is sensitive to any influence which touches his personal pocket-book and hence in some degree to anything which depletes the community pocket-book.

As a matter of fact, anything which affects the community financially in the long run does affect the individual. Hence it behooves us, it would seem to me, to ascertain definitely something of the community cost of illness. In order that we may have figures which may be used with the idea of influencing the opinion of the voter, these figures should be ascertained with regard to the Dominion, the provinces, and smaller communities. We have already some general figures as to the prevalence and cost of illness in the community; although these figures have been used before, I shall repeat some of them here.

THE VOLUME OF SICKNESS

In the first place, it would appear that *one* person out of *three* dies ahead of his time, of diseases which could be prevented. Professor Winslow of Yale University states that 29 per cent of all deaths in the United States Registration Area are postponable. An analysis of Ontario statistics would indicate that the average in that province is higher; that 34 per cent of all deaths are postponable. That is slightly over one in three! Similarly, Canadian statistics dealing with sickness indicate that over half of all disabling illness could be prevented.

Sound, authentic estimates show that from two to three per cent of the population is continuously on the sick list. Of these, between 91 per cent and 96 per cent are ill enough to be disabled, so that between 1.8 per cent and 2.9 per cent (let us estimate conservatively, 2 per cent) of our population is always too sick to work. Two per cent of Canada's population is 180,000 persons and that is a pretty serious, and expensive and dangerous sick list.

Public health officials agree that sickness costs the people of Canada over $311,000,000 a year. Almost nine-tenths of this is a direct charge upon the individual. But the loss in man-power is infinitely more staggering. Canada needs a larger population. Yet she is allowing so many Canadian lives to be taken by disease that an estimate places the loss in the future earnings of those sacrificed at over $500,000,000 a year.

TOLL OF DEATHS FROM PREVENTABLE DISEASES

I need not attempt here to summarize disease incidence in detail. The following general figures, however, are of especial interest because they are descriptive of cost covering items a large proportion of which are preventable or in the long run will be proved to be preventable. The following list of a few instances of mortality will give some point to this statement.

Diphtheria, with up to 13,500 cases in a single, comparatively recent year, has resulted in as many as 1,200 deaths, although in the year 1933 this had been reduced to 200. Typhoid fever was responsible for over 1,100 deaths in a single year recently. In the year 1933 there were only 280. Tuberculosis kills 7,000 in a single year. The toll of cancer has increased to 10,000 in a single year. Heart disease has increased to 14,000 in a single year. From 1,200 to 1,300 mothers die in childbirth annually.

THE COST OF ILLNESS

All these facts give one a picture of a problem which is of definite national significance, more important than any problem discussed by our legislators to-day. If one looks at the question from an economic standpoint alone one finds here an annual cost compared with which the cost of war itself pales into insignificance. After all, wars come only occasionally but the cost of illness has been with us year in and year out through the centuries.

In spite of this, the legislator looks upon the matter of direct health conservation as a question which he can afford to neglect. The provincial legislator goes on year after year spending the taxpayers' money for the building of asylums, hospitals, sanatoria, and institutions for the blind, deaf, and defective, without definite knowledge and due consideration of the proportion of preventable ills housed by these institutions. Provincial Ministers of Health find the greatest difficulty in obtaining adequate appropriations. The fact that the total expenditures on public health through all official channels in Canada are only $7,000,000 would prove that certainly adequate estimates are not voted.

I have tried to collect some figures on some of the costs of illness and prevention as compared with expenditures on public health. These rough figures will give some conception of a discrepancy which should be called to public attention. The following are the figures for Ontario for a recent year.

In the first place the total ordinary expenditure of the province was $54,846,349.28 during the year in question. The total expenditure on public health was $834,502.18 or considerably less than 2 per cent of the income. Expenditures which may be classified as being due largely to the existence of illness and defectiveness which are largely preventable are presented in table I.

This expenditure represents about 11 per cent of the total provincial income. In addition, however, an additional sum of $12,343,247.98 was furnished by municipalities and private subscriptions for the upkeep of hospitals alone, making an expenditure which may be largely traced to $18,794,100.66, or an amount equal to one-third of the total provincial expenditure.

Reference is not made here to the cost of Mothers' Allowances in Ontario which amounts on an average to about two million dollars a year. In view of the fact that Mothers' Allowances are paid to widows or deserted wives with dependent children it is obvious that this is very largely an indirect result of illness and might well be included in the bill of cost of illnesses.

TABLE I—PROVINCIAL EXPENDITURES RELATED TO CERTAIN PREVENTABLE CAUSES

Grants to hospitals	$1,776,520.33	
Mental hospitals	3,298,590.33	
		$5,075,110.66
Department of Welfare		
Industrial school grants	86,357.25	
Refuges	101,143.25	
Orphanages	56,032.70	
Training schools—Bowmanville	99,989.04	
Ontario Society for Crippled Children—grant	10,000.00	
		355,522.24
Department of the Provincial Secretary		821,676.12
Department of Education		
Blind	69,495.20	
Deaf	130,048.46	
		198,543.16
Total		$6,450,852.68

ARE THE PRESENT METHODS ADEQUATE?

The most important question which must be answered is whether the present method of controlling illness by leaving the matter to provincial and municipal initiative is sufficient. Many of us have for a good many years felt that it is not sufficient.

Here it may be profitable to review briefly the development of the Department of National Health. Over a period of successive years resolutions urging the establishment of a Federal department of health were passed by the Canadian Public Health Association, the Canadian Medical Association, the National Council of Women, the Dominion Trades and Labor Congress, and other associations of a national character. In 1919, because of the fact that a man with unusual qualifications was President of the Privy Council in the Union Government, the Federal Department of Health became an established fact and the basis was laid for the development of a Dominion health program. The most significant step taken at that time was the granting of substantial sums of money annually for the control of venereal diseases. These grants were made on the understanding that similar sums of money must be granted by the provinces and the result was that a fully co-ordinated program involving Dominion leadership and the participation of all the provinces was carried on and was very successful. I need not refer here in detail to the value of the activities of the Dominion Council of Health which came into being at the same time.

Since that time until recently successive governments have done little to establish the principle of Dominion leadership or to take advantage of the possibilities which were opened up by the establishment of a Federal Department with a Federal Minister of Health. The existence of a voluntary Health Committee in the House of Commons, organized by the Canadian Social Hygiene Council, has had much to do with the fact that the question of health and Federal responsibility in health matters has at least had some discussion on the floor of the House of Commons from time to time; and the serious considerations given by the House in 1929 to the possibility of developing a scheme for the establishment of county health units throughout the Dominion was encouraging in that it seemed that the principle of Dominion leadership as applied to the control of venereal disease might be applied also in other health fields. But the onset of the depression had extremely serious results. Grants to several voluntary associations undertaking educational work of a Dominion-wide character were cancelled altogether. Worst of all, perhaps, the grants to the provinces for the control of venereal diseases, after having been given continuously since 1920, were discontinued in 1932.

The discussion by the Dominion Government following a debate in January, 1935, to call a conference of all provincial Ministers of Health under the chairmanship of the Minister of Health of the Dominion to discuss the possibilities of co-operative action was logical and in accord with the frequently expressed opinion of Canadian leaders in public health. The announcement made at this conference of the formation of a Royal Commission to investigate the whole question of illness in Canada, its cost and its preventability, is one of the most interesting and stimulating developments of recent years.

THE NEED FOR A BROADER CONCEPT

I have summarized conditions thus in order to provide a basis for the suggestion that in our consideration of the matter of public health education we must develop a broader conception of the subject than we have in past years. We must have accurate statistics as to the cost of illness. I believe that a Royal Commission will be the most valuable means whereby such statistics can be gathered. I believe that it is wise to undertake

this on a Dominion basis because only by the development of a Dominion program can we make sure of efforts being made in all parts of Canada, rather than in isolated parts, as a solution of the difficulty. I do not mean to say that hospitals, municipalities, or provinces should not do much more than they have done in the direction of attempting to prove that there is a great deal of unnecessary waste in connection with financing hospitals and institutions with money which should be devoted to prevention. The point which I am trying to make is that the ultimate solution of the whole problem involves Dominion leadership and therefore it is natural that the Dominion should undertake an investigation.

If we had definite facts gathered in an official way it would become possible to develop a real Dominion program for the control of preventable illness. Such a program could become possible only by means of definite Dominion leadership and the assumption by the Dominion of more responsibility than it has shouldered in the past.

In order to avoid Dominion expenditure in these matters the argument has been used that under the British North America Act health is purely a provincial responsibility. Even a casual inspection of this Act will reveal the fact that such an argument is sheer nonsense. Not a single department of health was in existence when the British North America Act was passed and probably none of the originators of that Act even thought of the subject. Health conservation is the duty of everyone, and the Dominion, the provinces, municipalities, and private citizens must all play their part if mortality rates throughout the Dominion are to be lowered to an irreducible minimum.

The conference of Ministers in Ottawa last May was aptly styled a Cabinet of Health for Canada. Now that the first step has been taken, doubtless further conferences will be called from time to time and actually the Minister of Health for the Dominion and the provincial Ministers of Health will constitute a permanent Cabinet of Health. In the meantime, in order to ensure this desirable end it seems to me that individuals and organizations interested must do everything possible to call to public attention the facts of the situation, some of which I have outlined here. Every possible effort must be made to persuade organized groups to take into consideration the problem of national health as a problem of the greatest significance. Education as to personal health must be to a degree futile if we do not build up official machinery in the form of well-staffed departments of health covering not a portion of the Dominion but the entire Dominion, not limited to a few of the wealthier municipalities but covering poor municipalities, and rural, even sparsely settled Canada as well.

I have not had time to touch on the question of health insurance. This means of providing medical care for all is a topic of discussion in all parts of Canada to-day. Properly applied, health insurance is a public health measure in that it provides early care for illness. Its elaboration and proper application must come about as a result of study and education of the public. The work of the proposed Royal Commission should bring out facts both as to the need for a system for providing medical care for all and as to the means whereby the applications of such a system may be of such a character as really to diminish illness and reduce mortality rates.

I have tried in this brief paper to deal with the subject of public health education in a new way. The direct education of the public as to the ways and means by which individuals may avoid specific types of disease is of value but where we have health departments so inadequately financed and staffed as to be incapable of undertaking either administrative work or education it is obvious that our legislators need education; and our citizens need education as to the

possibilities of prevention in order that they may educate and influence our legislators. When we arrive at the state where prospective members in our legislative assemblies and Parliament come before the electors with a real public health program submitted as a reason for election or re-election, then we shall have achieved some of the real objectives of public health education. The most valuable form of wealth is not money but human life. Its conservation should be our greatest objective. To educate ourselves as citizens and as voters to this end should be our duty.

The Changing Concept of Public Health

PUBLIC health never has been the *first* concern of the State except in catastrophic situations. We are somewhat accustomed to accuse the politicians of lack of understanding, the medical profession of failure to co-operate, employers of unenlightened selfishness, trade unions of insistence upon measures not directly related but even inimical to health, and so on. If there is any blame to be attached to any one group, the professional sanitarian should come in for his share since the public looks to him to define the scope of public health. The trouble lies deeper. The prevailing concept of public health responsibilities has been and is too narrow. It is restricted to a few activities such as community sanitation, water supplies and food inspection, control of infectious diseases, education in hygiene, the medical care of the tuberculous and mentally diseased, and the medical care of the indigent. A newer concept which many sanitarians are coming to accept is much broader and far more sound. It may be stated in terms somewhat as follows:

Society has a basic responsibility for assuring, to all of its members, healthful conditions of housing and living, a reasonable degree of economic security, proper facilities for curative and preventive medicine and adequate medical care—in fact the control, so far as means are known to science, of all the environmental factors that affect physical and mental well-being.

The public health of the future demands some sensible co-ordination of public health functions with private medical practice, some solution of the economic problems that are involved in obtaining preventive and curative medicine, some set of procedures by which the physician, sanitarian, and social worker can do their best work in preventing disease, in the care of the sick, and in the rehabilitation of the unfortunate. — *Edgar Sydenstricker, The Milbank Memorial Fund Quarterly, Vol.* 13, *No.* 4, *October,* 1935.

Vaccination Against Tuberculosis with the BCG Vaccine*

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AS is well known, the late Professor A. Calmette introduced in 1921 the use of BCG vaccine as a preventive treatment of tuberculosis. It is not possible to review in this paper the essential findings which led to the development of this method. The basic conception of Calmette is expressed in the conclusion of his experiments in 1908, when he stated:

> "Animals naturally or artificially infected with small doses of bacilli are incomparably more resistant to an intravenous test inoculation than non-infected animals."

To obtain immunity, tubercle bacilli either killed by heat or modified by various physical or chemical agents were used as antigens. The results obtained by various workers were not sufficiently encouraging to warrant extended trial. In view of his findings, Calmette enunciated the statement: "Dead tubercle bacilli cannot produce immunity." Living virulent or attenuated bacilli were used by various observers in the attempt to produce immunity, but the only method which has received extended trial and has been found to be safe is that of Calmette. Calmette's account of the preparation of the vaccine and its use is as follows:

> "After numerous trials we have found in pure ox bile containing 5 per cent glycerine a medium in which successive cultures gradually lost their tubercle-producing property. These cultures, reinoculated fortnightly on the same medium, were no longer virulent at the end of four years either for the ox or the guinea pig. They were still virulent for the horse and the rabbit.
>
> "After 230 successive cultures made in thirteen years under identical conditions at 38° C., our bacillus had completely lost its tubercle-producing property and its virulence for domestic mammals (horse, ox, sheep, dog, rabbit, guinea pig, rat, mouse) and also for poultry (hens, pigeons). Considerable quantities of this bacillus, in a fine emulsion, could be injected intravenously or absorbed by the mouth by non-tuberculous animals without provoking the slightest ill effects and without giving rise, in the injected subject, to the slightest tuberculous lesion. Injected subcutaneously into guinea pigs in doses greater than 5 mg. (each fresh incompletely dried culture containing about 40 million organisms), it gave rise to a small cold abscess which, when evacuated externally, soon ended in cicatrization and left no trace except a slight subcutaneous induration. No congestion or hypertrophy of neighbouring glands was observed and the animal remained indefinitely in good health. The necropsy, performed six months afterwards or even later, did not reveal any trace of a tuberculous lesion in any viscera, or any organic alteration whatever.
>
> "The proof that this bacillus—called for convenience "BCG" vaccine (Bacillus Calmette-Guérin)—has hereditarily lost its tubercle-producing property and its virulence is given by the fact that we have never succeeded in restoring

*Abstract of a paper presented before the Section of Vital Statistics and Epidemiology at the Twenty-fourth Annual Meeting of the Canadian Public Health Association, Toronto, June, 1935.

its original qualities through successive reinoculations into various laboratory animals, whatever their age. Even bacilli which have remained for a year in the cellular tissue of the dewlap of young cattle and are still alive have been non-virulent for guinea pigs. Consequently one may take it for granted that there is no cause to fear, apart from the action of artificial laboratory processes, a return of virulence or a reappearance of the tubercle-producing property of the bacilli.

"These experiments have enabled us to demonstrate that with our non tubercle-producing bacillus one may confer on young animals which are unquestionably free from pre-existing tuberculosis the same tolerance to reinfections acquired by subjects slightly affected by a benign tuberculous infection (latent or occult infection).

"As a matter of fact, this state of resistance to reinfections, which is characteristic of tuberculosis immunity, is not peculiar to tuberculosis. It is, indeed, a process of vaccination comparable to that obtained by means of virus vaccines but with the distinctive feature that our germs persist in the lymph organs of immunized individuals.

"One must therefore admit that the prevention of bacillary infection, in infected areas, can only be usefully attempted among very young subjects by permeating as early as possible their whole lymphatic system with a living non tubercle-producing virus."

VACCINATION IN MAN

Encouraged by the positive results given by these numerous trials, Calmette, through the co-operation of Dr. E. Weill-Hallé, physician to hospitals and director of the School of Paediatrics, and with the consent of the parents, inaugurated the application of his method to man in July, 1921.

The unavoidable danger of severe tuberculous infection to babies born and brought up in contaminated surroundings is well known. In the dispensaries controlled by the Comité National de Défense contre la Tuberculose, in France, it was found that more than 25 per cent of children born of tuberculous mothers or brought up in a contaminated home died of tuberculosis during the first year of life.

Briefly the results obtained are presented in the following statement.

> "From July 1921 to July 1922 the vaccine was administered to 120 new-born babies. The first demonstration was the absolute harmlessness of the vaccine. From July 1922 to January 1926 Weill-Hallé and Turpin gave it to 317 babies, 77 of whom were born and brought up in a contaminated home. Out of these 77 babies only one died of tuberculosis."

Encouraged by the results obtained, arrangements were made by Calmette on July 1, 1924, for the distribution of the vaccine to all physicians requesting it.

> "From July 1, 1924, to July 1, 1926, 5,183 new-born babies were vaccinated in France. Out of this number, 586 were, for a period of six to eighteen months, in contact with open cases. The tuberculosis mortality in this group was 1.8 per cent. It seems, therefore, that it must be taken for granted that immunization of the new-born by means of the BCG vaccine enables us to save at least 73 per cent of children who, without such immunization, would succumb to tuberculosis during the first year of life."

CANADIAN EXPERIENCE

In 1925 the National Research Council appointed a subcommittee on tuberculosis research. As part of the program of research studies suggested by the sub-committee, the University of Montreal undertook to investigate the value of Calmette's

BCG vaccine. The University of Montreal was fortunate in having Professor A. Pettit delegated by the Pasteur Institute to direct the work, which he undertook in April, 1926. He personally supervised the preparation of the vaccine until March, 1928, when he returned to Paris. He was succeeded by Dr. J. A. Breton, and the work is now under the direction of Dr. A. Frappier, Professor of Bacteriology in the University of Montreal.

During the past seven years the vaccine has been prepared and observations have been made on a large number of infants. The work has been possible through the generous support of the National Research Council. In the period June, 1926, to December 31, 1934, the vaccinations numbered 5,126. Of these, 1,519 were performed during the year 1934. The progress during 1934 has been most gratifying. Two public health nurses are engaged in making observations, Miss A. Seguin, who has been active in the work since its inception, and Miss S. Gosselin, who commenced her work this year. Of the 1,519 vaccinations in 1934, 1,102 were performed in hospitals, 355 by private physicians and voluntary health associations, and 62 in the Bruchési Antituberculosis Institute.

Table I presents the results of the investigation in regard to contact of the infants to tuberculosis in families. The investigations were made by the public health nurses and only a small number of children could not be located.

From this table it is evident that 582 vaccinated new-born babies were in contact with either positive-sputum cases or clinically diagnosed or suspected cases of tuberculosis, an increase of 147 over 1933.

A comparison of the findings in the group of vaccinated contact babies is possible through a study of table II in which the observations in the control group of unvaccinated babies are presented. The continuous and generous co-operation of the Bruchési Antituberculosis Institute made possible these observations.

The number of observations made in 1934 in the group of unvaccinated new-born babies shows an increase of 307 over the year 1933. Of the 1,553 babies in contact with tuberculosis, as presented in tables I and II, 582 were vaccinated and 971 were not vaccinated. A further division of the group to include only those exposed to positive-sputum cases shows 249 vaccinated and 500 not vaccinated. Our objective in the study was to obtain 500 vaccinated

TABLE I

INVESTIGATION OF CONTACT WITH TUBERCULOSIS IN BABIES VACCINATED AT BIRTH
1926-1934

Year when Vaccinated	Number Investigated				Not Investigated		Total Vaccinated
	Contact						
	Positive sputum cases	Clin. susp. cases	No known contact	Total investigated	Not found in 1934	Not yet investigated	
1926	4	17	55	76	3	5	84
1927	34	42	189	265	8	55	328
1928	25	34	147	206	5	135	346
1929	29	36	182	247	10	83	340
1930	55	55	423	533	9	241	783
1931	22	18	57	97	0	188	285
1932	15	29	70	114	2	288	404
1933	38	56	75	169	0	868	1037
1934	27	46	129	202	0	1317	1519
Total	249	333	1327	1909	37	3180	5126

and 500 unvaccinated babies in contact with positive-sputum cases. Satisfactory progress is therefore being made towards this objective. When this is achieved, our study will be less extensive and more intensive. This report presents a survey of all our cases in regard to mortality and morbidity.

Mortality

Among our 1,553 babies there occurred 282 deaths, 61 among the vaccinated group and 221 among the unvaccinated. Their age distribution is presented in table III. Deaths occurring during the first month of life have been omitted.

Specific mortality rates for the two groups are presented in table IV. In the calculation of these rates the deaths under one month of life have been omitted.

The mortality experience, which has always been more favourable in the vaccinated group, is still more striking in 1934. Such a result is to be anticipated in view of the increasing size of the group. In 1934 the difference is 45 per cent in favour of the vaccinated group as compared with 27 per cent in 1933. In other words, the deaths in the unvaccinated group are almost double those among the vaccinated babies. These findings are in complete accord with those generally recorded in other countries.

The protection afforded by vaccination is further shown when the deaths are analyzed according to cause. Such an analysis is presented in table V.

TABLE II

INVESTIGATION OF CONTACT WITH TUBERCULOSIS
NEW-BORN BABIES NOT VACCINATED

Years	Positive Sputum	Clinical and Suspected Cases	Total
1926	54	37	91
1927	101	60	161
1928	89	85	174
1929	73	58	131
1930	59	60	119
1931	53	76	129
1932	39	54	93
1933	21	27	48
1934	11	14	25
Total	500	471	971

TABLE III

AGE DISTRIBUTION OF DEATHS IN VACCINATED AND NON-VACCINATED GROUP IN CONTACT WITH TUBERCULOSIS

Years	Vaccinated				Not Vaccinated			
	0-1 m.	1-12 ms.	1-5 yrs.	Total	0-1 m.	1-12 ms.	1-5 yrs.	Total
1926	0	2	5	7	1	3	14	18
1927	0	9	4	13	7	12	15	34
1928	1	6	6	13	9	21	13	43
1929	0	5	1	6	8	22	11	41
1930	0	7	5	12	6	16	11	33
1931	0	3	1	4	7	16	7	30
1932	0	2	0	2	6	5	2	13
1933	0	1	1	2	4	4	0	8
1934	0	2	0	2	1	0	0	1
Total	1	37	23	61	49	90	73	221

Considering the two groups from the standpoint of deaths from causes other than tuberculosis, which occasioned 48 deaths in the vaccinated group and 107 in the unvaccinated group, we find that the mortality rate in the vaccinated group from these causes was 82.5 and in the unvaccinated group 116 per thousand, a difference of 29 per cent in favour of the vaccinated babies.

Similarly when the deaths from tuberculosis in the two groups are compared we find that the tuberculosis death rate per thousand vaccinated babies was 21, in contrast with a mortality rate of 70 in the unvaccinated group. In examining these data it is found that the mortality rate in the vaccinated group of 1-12 months was only one-quarter of that of the unvaccinated group, and in the second group of 1-7 years approximately one-third. These figures indicate a more favourable result than that recorded in previous years.

The striking differences in the mortality rates for tuberculosis of the vaccinated and unvaccinated groups are even more evident when the comparison is limited to babies in contact with positive-sputum cases. Such an analysis is presented in table VII.

The tuberculosis death rates of babies in contact with positive-sputum cases in the vaccinated group was 24 per thousand, whereas in the unvaccinated group the rate was 111, approximately four and one-half times as great. Considering the group of vaccinated babies 1-12 months, the rate was only 8 per thousand, in comparison with 49 per thousand in the unvaccinated group,—six times as great,—and in the group 1-7 years 18 per thousand among the vaccinated as compared with 64 per thousand in the unvaccinated.

The protection following vaccination is evident from these data and is particularly striking in babies under one year of age. The results obtained in the group under one year of age are the most significant. All workers interested in this problem study particularly the tuberculosis mor-

TABLE IV

SPECIFIC MORTALITY RATES* IN VACCINATED AND NON-VACCINATED GROUPS IN CONTACT WITH TUBERCULOSIS

Age	Vaccinated			Not Vaccinated		
	Number	Deaths	Rate per 1000	Number	Deaths	Rate per 1000
1-12 ms.	581	37	64	64	922	107.0
1-7 yrs.	508x	23	45	897x	73	81.5
Total	581	60	103	922	172	187.0

*Excluding deaths under 1 month.
xThese figures include all babies less those of 1934; they are thus included in the total figures of 581 and 922 respectively.

TABLE V

DEATHS ACCORDING TO CAUSES

Age	Vaccinated Babies			Unvaccinated Babies		
	Tuberculosis	Other Causes	Total	Tuberculosis	Other Causes	Total
1-12 ms.	5	32	37	31	68	99
1-7 yrs.	7	16	23	34	39	73
Total	12	48	60	65	107	172

TABLE VI

SPECIFIC DEATH RATES FROM TUBERCULOSIS

Age	Vaccinated			Not Vaccinated		
	Number	Tb. Deaths	Specific Rate per 1000	Number	Tb. Deaths	Specific Rate per 1000
1-12 ms.	581	5	8.6	922	31	34
1-7 yrs.	508x	7	14	897x	34	38
Total	581	12	21	922	65	70

xThese figures are included in the 1-12 month group.

TABLE VII

TUBERCULOSIS DEATH RATES OF BABIES IN CONTACT WITH POSITIVE-SPUTUM CASES

Age	Vaccinated			Not Vaccinated		
	Number	Tb. Deaths	Specific Death Rate	Number	Tb. Deaths	Specific Death Rate
1-12 ms.	248	2	8	451	22	49
1-7 yrs.	221x	4	18	440x	28	64
Total	248	6	24	451	50	111

xThese figures are included in the 1-12 month group.

TABLE VIII

DISTRIBUTION OF CONTACT BABIES ACCORDING TO THEIR STATE OF HEALTH

State of Health, 1934	Vaccinated			Not Vaccinated		
	Positive Sputum	Clinical and Susp. Cases	Total	Positive Sputum	Clinical and Susp. Cases	Total
Apparently in good health...	192	261	453	276	268	544
Suffering from different diseases	33	30	63	86	75	161
Suffering presumably from tuberculosis	4	1	5	24	21	45
Total	229	292	521	386	364	750

TABLE IX

DISTRIBUTION OF CONTACT BABIES ACCORDING TO THEIR STATE OF HEALTH EXPRESSED AS PERCENTAGES

	Vaccinated			Not Vaccinated		
	Positive Sputum	Clinical and Susp. Cases	Total	Positive Sputum	Clinical and Susp. Cases	Total
Apparently in good health	89.6	86.9	87.9	76.2	74.9	75.6
Suffering from different diseases	9.0	11.5	10.6	17.3	20.6	18.8
Suffering presumably from tuberculosis	1.4	1.6	1.5	6.5	4.5	5.6
Total	100.0	100.0	100.0	100.0	100.00	100.0

tality rate in babies under one year of age who are in contact with positive-sputum cases. Statistics confirm the great danger of such children becoming infected and dying from the disease. This group was the first to be studied by Calmette and it is most gratifying to note how closely our figures are in accord with those obtained in other countries. A tuberculosis mortality rate of only 8 per thousand in the vaccinated group, as compared with 111 per thousand in the unvaccinated group, a difference of 84 per cent in favour of the vaccinated group, is evidence of the real protection afforded these babies by vaccination.

Morbidity

It is of interest to record other findings in the investigation of the babies in the two groups who have had contact with tuberculosis. These observations are recorded in tables VIII and IX. In table IX the percentage distribution is presented.

From tables VIII and IX it is evident that the health record of the vaccinated group is more favourable than that of the unvaccinated group. This is particularly shown when the comparison is limited to babies in contact with positive-sputum cases in both groups, the difference being markedly in favour of the vaccinated babies. It is noted again this year that the results are even more favourable in the vaccinated group than were recorded in previous years. This is the result probably of the larger size of the groups under observation.

The findings tend to show more and more conclusively with each succeeding year of observation that BCG vaccination against tuberculosis must be included as part of a complete campaign for the control of this disease.

Scope for Improvement in Canadian Stillbirth Statistics*

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THE reduction in infant mortality in Canada since 1921 has been gratifying, but this reduction has been achieved in great measure by reduction of deaths of infants from 1 to 11 months of age. The toll of infant death in the first month of life remains high and in company with this neonatal mortality the recorded stillbirth rate continues to be maintained. Foetal mortality, particularly that among foetuses reaching the age of viability, described as stillborn, is of great importance because many of the causative factors involved are closely related to those which are responsible for neonatal deaths. It is therefore opportune to consider from a practical standpoint the scope and necessity for improvement in stillbirth statistics in Canada.

A consideration of the number of stillbirths recorded each year serves to emphasize the fact that the subject is one of great importance. In Canada, in the year 1933, recorded stillbirths numbered 6,848. In the same year the infant deaths under one year amounted to 16,284. Thus the number of stillbirths was about 42 per cent of the number of infant deaths. The mortality among viable infants before, during or after birth, but before pulmonary respiration has been established, is therefore considerable and deserves careful consideration.

At the present time, statistics of stillbirths leave much to be desired. The causes of stillbirth are, as yet, not well understood and no scheme for their classification has yet been devised in Canada. There is no doubt, however, that statistics of stillbirths both in their national and international aspect can be improved so as to provide information of great value both to those who are studying the extent and the causes of foetal mortality as well as to child hygienists in general.

In the way of international comparability of stillbirth statistics there are many obstacles, the principal one being that the definition of stillbirth varies from country to country. A few years ago the International Statistical Institute obtained information from various countries on this subject and the definitions given were far from uniform. These definitions are given in detail in an appendix to this paper. The minimum period of gestation, where stated, varied usually between six and seven months, but in some cases it was not stated and in others the criterion was given in a vaguer way, e.g. "viability" (Austria); "a degree of development which permitted the determination of sex" (France). In certain countries, e.g. France, Italy, Belgium, and The Netherlands, the legal distinction between live birth and stillbirth appeared to rest on whether the child was alive at the time of the registration of the birth or whether it was dead at this time. In other words, in these countries stillbirths in the legal sense included not only the children who were born dead but those who died before the registration which might have taken place several days later. Obviously, for statistical purposes, this definition is

**An address delivered at a special Dinner Session of the Section of Vital Statistics and Epidemiology held in honour of Mr. Macphail at the Twenty-fifth Annual Meeting of the Canadian Public Health Association, Toronto, June, 1935.*

useless, and some of these countries, e.g. The Netherlands, Belgium, Italy, for statistical purposes distinguish between the children born dead and those who died after birth but before registration. So far as the Bureau of Statistics can ascertain, this information is not always available in the French reports, and the statistics of infant mortality regularly published for France are deceptive to this extent. In the United States, too, there is great variation in the definition of stillbirths in different states, though the attempt is being made to bring about uniformity.

In England and Wales the registration of stillbirths was not compulsory until the revision of the Registration Act in 1926. In this Act a stillbirth was defined as "any child which has issued forth from its mother after the twenty-eighth week of pregnancy and which did not at any time after being completely expelled from its mother, breathe or show any other sign of life."

In Canada the Acts of the various provinces do not in general specify a minimum period of gestation for the registration of a stillbirth. For statistical purposes the Vital Statistics Section of the Canadian Public Health Association in 1931 recommended that the definition of stillbirth rest upon a minimum period of gestation of 6½ months or 28 weeks and the non-establishment of pulmonary respiration after complete birth. This was the definition of a committee appointed by the Health Section of the League of Nations, 1925. In most provinces special instructions have been issued on the basis of this definition and in at least one province an amendment has been made to the Vital Statistics Act, embodying this definition of stillbirth.

THE CASE FOR A SPECIAL STILLBIRTH FORM

In order to secure data concerning foetal deaths which fall within the above definition, it is necessary to have reliable information regarding the period of gestation. At the present time in all the provinces of Canada except Quebec, stillbirths are registered as both births and deaths on the standard birth and death forms and the only place where the period of gestation is called for, or can be conveniently reported, is on the birth certificate. If, however, a special form were provided on which the period of gestation would form part of the medical section of the certificate, to be filled in by the doctor in attendance, it would be a distinct advantage, except in those instances when a physician was not present at the confinement.

In the province of Quebec a special stillbirth certificate is used and the medical statement includes a record of the period of gestation. This certificate is also used for foetuses of less than 28 weeks' gestation, separation of these groups being effected by the data given on the form, and the procedure affords no statistical difficulties. The Quebec certificate furnishes all the statistical information which is obtained from other provinces by the registration of stillbirths as both births and deaths and has been approved by the Dominion Bureau of Statistics for the purpose of the co-operative system under which our Canadian vital statistics are collected and compiled.

One difference between the special form for stillbirths used in Quebec and those used in other provinces should be pointed out. The Quebec special form is used not only for stillbirths but also for children dying within the first 24 hours. The purpose of this extension is evident. The reason for it was embodied by Dr. Gagnon in his report of 1932. The stillbirth definition includes children who have not breathed after birth although some indication of life may have been observed; and it was felt that "this form should be extended to all children dying within 24 hours of birth, provided the birth has not already been

registered, on account of the fact that Roman Catholic physicians have a tendency to report as live births children who have not breathed but whose life was not altogether extinct." A question regarding pulmonary respiration definitely enables the statistical distinction between live birth and stillbirth on this basis. Such an extension would probably not be considered practicable in those provinces in which civil registration is in force, and where the form is used for legal and administrative as well as statistical purposes. It is well to keep in mind that under English law there appears to be no doubt that a child may be held to have been born alive even if it has not breathed after birth, as is evident in the definition of stillbirth given above, but I do not think that the difficulty in the other provinces can be overcome in this way.

Another advantage attainable by the use of a separate stillbirth form would be that it would contain a medical certificate specially designed to secure the cause of the stillbirth as far as this is ascertainable. The commission revising the International List of Causes of Death in 1929 adopted a brief list of causes of stillbirth, which grouped such causes under three headings: (1) foetal mortality during gestation, (2) mortality due to premature expulsion, and (3) foetal mortality during parturition. Suffice it to say that under the present system in vogue in all provinces except Quebec the cause of death is frequently given as "stillbirth" with no further explanation. It is true that in many cases the physician might be able to give no further information, but it is worth considering the advisability of having a certificate which called definitely for the information whenever it was available.

To what extent there may be value in the reporting of all pregnancies and their duration before interruption is for the medical man to determine. But for all practical considerations it is felt that we should, for the present at any rate, confine our attention to the registration of products of conception of twenty-eight weeks or more. This does not mean that we need object to the registration of a foetus which has not attained the age of twenty-eight weeks, but the acts and regulations of each province should ensure that no foetus which comes within the statistical definition shall escape registration. Moreover, it is necessary to ensure that the age of the foetus shall be stated in weeks to the best of the physician's ability. Up to the present, in the provinces in which we have to rely on the birth certificate for the information regarding the period of gestation, we frequently find this information lacking even though the birth is stated to be premature. In many other cases, although all birth certificates call for this period in weeks, it is stated in months, and it becomes difficult or impossible to interpret such statements. Even if the statement of the period of gestation be incorporated in the medical certificate of a special stillbirth form and called in weeks, this difficulty may persist and it may be necessary to consider the advisability of using another criterion of viability, i.e. the length of the foetus. The Committee of the Health Section, League of Nations, whose definition was adopted in Canada, stated that the foetus of twenty-eight weeks would normally measure 35 centimetres (or 14 inches) when fully extended.

CONCLUSIONS

There is no doubt that there is real need for stillbirth statistics as carefully collected and compiled as circumstances will permit, on a scale comparable to those of births and infant deaths. Uniformity in terminology and registration practice is essential for without these things stillbirth rates can have no real significance and cannot be comparable. Having adopted a definition, we should do our best to ensure that this definition is properly implemented. The present situation

leaves something to be desired in this respect.

In view of reports presented by the Committee on Stillbirth Vital Statistics of the Canadian Public Health Association, it would appear to me that the time has come when the Dominion Bureau of Statistics might properly approach the provinces to obtain their opinions on the practicability of introducing a single stillbirth registration form to supersede the present double registration system. At the same time, the question of incorporating the new statistical definition of stillbirth into the registration acts of the various provinces might be discussed. If agreement can be reached, the form of the medical certificate on the stillbirth form becomes the next matter for consideration, and in this matter it would appear wise to consult the Committee on Certification of Causes of Death in order to obtain competent and representative advice. These, I believe, are the steps which I would wish to take if I were still active in the Bureau of Statistics, and I bespeak the support of the members of the Vital Statistics Section on behalf of these steps, which I understand are now contemplated by the Bureau.

APPENDIX

DEFINITIONS OF STILLBIRTHS IN VARIOUS COUNTRIES*

Prussia. The following are considered as stillborn:

(a) Children born at full term and coming into the world without life;

(b) Foetuses which after 180 days of gestation (6 months) are born without life and have a length of 32 centimetres; and

(c) Foetuses born almost at full term.

The foetuses which do not clearly come under one of these three categories are not officially considered as having been born.

Austria. Registration is not required except for children born without life and having attained a development which would have rendered them viable. The births of non-viable children are considered as abortions or miscarriages and the registration of their birth is not necessary.

Belgium. A circular of 1878 has determined what should be understood by stillborn in the proper sense of the term and by other children presented without life.

(a) By a child presented without life will be understood one whose birth has not been registered and which is presented without life to the registrar. (Decree of the 4th July, 1806).

(b) A child born without life after the 180th day (sixth month of gestation) shall be considered as stillborn (argument of Article 312 of the Civil Code).

Bulgaria. Neither the law nor the regulations giving a definition, the Office of the Director General of Statistics has adopted the precise scientific definition and has reproduced it in its circular. The minimum period of gestation is set at six months and the minimum length at 32 centimetres. To be born alive it is required that the child shall have breathed.

Denmark. Every child born alive at whatever period of gestation the birth takes place is registered as born alive. Every foetus leaving the maternal womb during or after the 29th week of gestation and not presenting any sign of life is registered as stillborn. When the event takes place before the 29th week it is considered as an abortion and not registered.

Spain. Children who have come into the world without giving any sign of life and those which were born alive but have died in the 24 hours following birth are considered as stillborn.

**Extracted from "Movement of Population (Europe)", published by the International Statistical Institute, The Hague, 1917, with amendments published at a later date.*

France. The Bureau of Civil Registration considers as stillborn all children who have left the maternal womb without giving any sign of life and those which have given a sign of life but have died before the declaration which can be made at any time within the three days following the birth; the result is that a certain number of children who were born alive are registered as stillborn. In virtue of an order of the Court of Besançon (31st October, 1844) French jurisprudence prescribes the registration as stillborn not only of children born at full term but all those whose development at the moment of birth permitted the determination of their sex.

Italy. Children who have died before or during the birth are considered as stillborn; all others are born alive. A child which was born alive and which has died before the declaration is stillborn according to law, but for statistical purposes it is considered as having been born alive.

Norway. The foetuses born without giving any sign of life after the commencement of the eighth month of gestation are registered as stillborn.

Holland.

(1) The following are registered as stillborn:

(a) Children born at full term and before full term who are born without life;

(b) Children born alive and who have died before the day of the declaration, which must be made within three days following the birth. This delay may be prolonged to six days by public holidays.

(2) In Dutch statistics mention is made, not of "stillbirths" but of "children presented without life."

(3) Commencing with 1917, for statistical purposes the question is asked at the time of the declaration whether the child presented without life has lived and how many days it has lived.

Roumania. The registration of stillbirths is required when the foetus is viable. Children born alive but dying before registration are registered as live births.

Finland. Every child born at full term and who at birth does not give any sign of life is considered as stillborn.

The registration as stillborn is necessary for every foetus which is born without life after six months of gestation.

Sweden. A child is registered as born alive when it breathes after birth and as stillborn when after birth it does not give any sign of life. The minimum period of gestation for the registration of a stillbirth has been fixed by regulation at 28 weeks.

Switzerland. A child which dies before, during, or after birth, but without having breathed, is taken as a stillborn child if the birth has occurred after the sixth month of pregnancy.

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THE DEVELOPMENT OF PUBLIC HEALTH IN CANADA

IT is gratifying to the Editorial Board that early this year the series of articles outlining the development of public health in Canada, which have been contributed by members of the Federal and the Provincial Departments of Health, will be made available in booklet form by the Association. These articles have been published during the past two years and have been greatly appreciated. Their preparation has entailed extended study of the early records and they bring together many important contributions which not only are of historical value but record achievements by those who pioneered in public health work. These achievements give encouragement to-day to public health administrators who face problems which are challenging their best efforts.

An introduction to the series was contributed by Dr. J. J. Heagerty, whose position as a medical historian is so well known. In a recent issue Dr. Heagerty also outlined the history and activities of the Department of Pensions and National Health. Through the co-operation of the Provincial Bureau of Health, Quebec, an extended study was made of historical documents and the article contributed on the story of public health in that province is one of special interest and value. Similarly the Provincial Department of Health of Ontario co-operated in the preparation of an outline of the development of the health organization. The interesting period of 1791 to 1867 as it related to Upper Canada was the subject of an interesting review by Dr. K. F. Brandon.

Under the guidance of Dr. H. E. Young, Provincial Health Officer, a careful study was made of the early records in British Columbia and the findings presented in a most interesting article by Mr. J. T. Marshall, Inspector of Vital Statistics, in which he traced the health organization from 1869. Dr. Ross Mitchell, author of numerous articles on early medicine in Manitoba,

prepared the article on public health in that province, reviewing briefly the organization in the North West Territories. With Mr. F. T. Cook, Dr. M. R. Bow, Deputy Minister of Public Health for Alberta, continued the series with a review of Alberta's history; and the story of public health in the Western Provinces was completed in December with the publication of the outline of the developments in Saskatchewan by Dr. R. O. Davison, Deputy Minister of Public Health.

Through the co-operation of Dr. B. C. Keeping, Deputy Minister of Public Health for Prince Edward Island, and of Dr. Wm. Warwick, Chief Medical Officer for New Brunswick, the growth of the health organization in these provinces, so rich in historical interest, has been traced from the days of the first French settlements. With Dr. P. S. Campbell, Chief Health Officer, Dr. H. L. Scammell is making a study of the early records in Nova Scotia, and with the publication of this article in an early issue the series will be completed.

The Editorial Board expresses its hearty thanks to those who have given such splendid co-operation in this effort to record the story of public health in Canada.

THE COMING VANCOUVER MEETING

THE announcement in this issue of the JOURNAL of the convening of the twenty-fifth annual meeting of the Association in Vancouver during the week of June 22nd will be received with great interest by the members of the Association, particularly those in Western Canada.

The Vancouver meeting in that year was one of the most important in the history of the Association. A plan was presented by Dr. H. E. Young, then President of the Association, and Dr. R. D. Defries, then General Secretary, for a closer relationship of the Public Health Journal and the Association. It will be remembered that prior to 1928, when the Association purchased the JOURNAL and assumed its editorial direction, the publication of the JOURNAL had been made possible by a small group of interested members under the leadership of Dr. Gordon Bates. The steps taken at the meeting led finally to the acquiring of the JOURNAL by the Association. There was a defining also of the place and possibilities of the various Sections of the Association, which has had a far-reaching effect on the policy of the Association. The coming meeting finds the Association with clearly defined objectives and the fulfilment of plans which were made in Vancouver sixteen years ago.

In accepting the invitation of the Province and of the City of Vancouver the Executive Committee was delighted to learn that as a tribute to Dr. H. E. Young, Dean of Canadian health officials, the Western Branch of the American Public Health Association and the State and Provincial Health Authorities of North America, both of which organisations have honoured Dr. Young by electing him President, were similarly accepting an invitation to hold their annual meetings in Vancouver and Victoria, thus making possible joint meetings of international interest.

LETTER FROM GREAT BRITAIN

GEORGE F. BUCHAN, M.D., F.R.C.P., D.P.H.
London

The State of the Public Health

THE Annual Report of the Chief Medical Officer of the Ministry of Health for the year 1934 has been published. It is the first report of the kind for which Dr. MacNalty, the new Chief Medical Officer of the Ministry, is responsible, and is an important addition to a long series of valuable reports. The Report records a higher birth rate and a lower death rate as compared with the previous year and an infantile mortality rate of 59 per 1,000 births, or the lowest on record. The five principal certified causes of deaths at all ages in order of magnitude are (1) diseases of the heart and circulatory system, (2) cancer, (3) respiratory diseases, (4) diseases of the nervous system, and (5) tuberculosis.

The year 1934 has shown no reduction in the maternal death rate but rather a slight increase. There have been many improvements in the provision for maternal care during the year and on pages 47-54 of the Report are described the measures which have been and are being taken by the Ministry to grapple with the problem of maternal mortality. Special attention is being given to areas in which the maternal death rate has been consistently high and expert medical officers of the Ministry are making an intensive study of these areas. It is pointed out that the interest aroused in the subject of maternal mortality is valuable but that such interest may be detrimental if the public attention drawn to the matter arouses undue anxiety in expectant mothers.

The subject of cancer has a section in the Report all to itself. The number of deaths due to cancer during the year was 63,263, which, compared with the previous year, is an increase of 1,691. It is suggested that some at least of the increase is apparent rather than real and that it is possible that a peak or plateau of mortality is being approached. The current cancer research is summarised and the conclusion drawn that steady progress is being made though "it may well be that the practical application of the results of such researches is far distant; any hopes based on them should not interfere with the pursuit of investigation in the clinical field."

Considerable space is allotted to the subject of nutrition. It is pointed out that the term "minimum diet" is frequently misunderstood. It means the smallest amount of food which is necessary to keep the body healthy and efficient and to maintain it in a state of equilibrium under the environmental and physiological conditions of life of the individual. The "minimum diet" is no more a starvation diet than it is an excessive diet.

There are other sections in the Report dealing with general epidemiology, the insurance medical service, tuberculosis, venereal diseases, medical intelligence, medical research and international health.

Altogether the Report is an exceedingly valuable document and shows the enormous field which is covered by the Ministry of Health. An interesting statement as to the work of the Ministry is contained in the introductory section of the Report. The State control of health began from small beginnings and has culminated in a central authority of comprehensive health services which is interlinked and intimately co-ordinated, not only with local authorities and the multiple health bodies of Great Britain, but with the health services of the whole

world. It aims at bringing every advance in medical science, every measure calculated to maintain health and to prevent disease, to the service of the people and to make health the birthright of every inhabitant of this country. It rests with the people to participate in the work of the Ministry in order to make it effective. No exhortations, no regulations, no schemes however ably planned, can make a healthy nation unless the force of public opinion is behind them and, lastly, this support must be more than lip service. The individual must pay the price of health in temperance, self-control, in regular habits and in hygiene of mind and body.

HYGIENE IN INDUSTRY

The Annual Report of the Chief Inspector of Factories and Workshops for the year 1934 contains reference to some matters of considerable medical interest. The subject of noise, including its causation and the effect of noise in industry, has received special attention during the year. The amount of sound in a factory is largely governed by the design, age and maintenance of the plant, and the contrast between the noise in an old mill and one with modern transmission driving is very marked. The tolerance to noise which workers acquire is really amazing. In a weaving shed, for example, the operatives can converse without apparent effort, while a visitor finds it almost impossible to give audible speech. One would expect that noise must eventually have some injurious effect; yet, apart from boiler makers and shipyard workers who are subject to deafness, complaints from operatives are hardly ever received. Noises, particularly of the loud and discontinuous type, do appear, however, to have disturbing effects upon persons not associated with their causations. Apart from the question of health hazard, other aspects of noise have been studied: (a) the effect of noise on efficiency and production—the Industrial Health Research Board found that in a weaving shed a slight but persistent increase in output resulted when the workers wore ear defenders; (b) the relationship of noise to the causation of accidents—no clear case of such an association could be traced.

The subject of health generally is also dealt with and as might be expected from the rise in employment in this country, there has been an increase in the cases of industrial poisoning and disease notified to the Inspectors. Lead poisoning cases, both fatal and non-fatal, showed an increase, averaging 16 per cent, due probably to the wider demand for certain products containing a high lead content, as well as to greater industrial activity. The number of deaths from epitheliomatous ulceration remains high in certain industries, and is likely to remain so until periodical medical examination is universally adopted.

The provision of voluntary welfare amenities continues rapidly. The best firms, when erecting new factories or making additions to existing works, make provision for canteens and messrooms in their plans. The selection of entrants to the various trades remains on the whole haphazard. Many firms still prefer a notice in the window to application to the Employment Exchange or Juvenile Employment Bureau, but others are recognising the wastefulness of chance methods.

THE MEDICAL CURRICULUM

The medical curriculum is the subject of considerable discussion in this country at the present time. The Curriculum Committee of the General Medical Council have issued a report. A Conference of Representatives nominated by the Universities of Oxford, Cambridge and London and the Royal Colleges and the Society of Apothecaries of London have also issued a report. A Committee of the British Medical Association has also recorded its findings. These are the main reports under discussion by prac-

tically all the teaching bodies and examining bodies in this country. There is considerable agreement in regard to the lines on which alteration should be planned. It is recommended that the minimum age of admission to the medical curriculum proper should be eighteen years, after which the student will for two years devote himself to the professional scientific subjects, anatomy and physiology, and receive an introduction to the clinical subjects, the teaching of which should extend over the remaining three years of the medical curriculum.

The whole idea as outlined in the various reports is that the standard of general education of the medical student should be raised and that the professional scientific studies during the first two years of the medical curriculum should be taught in such a manner as to link them up with his later clinical studies. The clinical studies again, should be conducted in an even more practical manner than they have been hitherto. It is suggested, for example, that every student should hold a resident hospital appointment before being eligible to enter upon general practice. The methods suggested for providing the necessary time for this fall into two main categories: (a) that the period should be subsequent to the completion of the five years' curriculum; or (b) that a period of six to nine months in the final clinical year should be allotted to such appointments. There is no doubt about the desirability of the proposal but its practicability appears to be doubtful.

It is also suggested that the student's attention should be directed to normal psychology and that more use should be made of the out-patient departments of hospitals where minor ailments and the early beginnings of disease are more likely to be seen and can be demonstrated to the medical student. Particularly the need for emphasising the preventive aspects of medicine throughout the whole course of the curriculum is brought to notice and it is suggested that throughout the whole period of study the attention of the student should be directed by his teachers (a) to the means and the measures by which normal health may be maintained, and (b) to the principles and practice of the prevention of disease.

The need for teaching students the legal and ethical problems of registered practitioners is also the subject of recommendation.

What the final outcome of these various reports may be is not easy to say but their considerable unanimity indicates that it is not unlikely that some measures will be taken along the lines suggested.

LABORATORY SECTION

DIARRHOEA AND TYPHOID INFECTIONS*

ELIZABETH CHANT ROBERTSON, M.A., M.D.

IT is well known that a water-borne epidemic of typhoid is almost invariably preceded by a much more widespread outbreak of gastro-enteritis (1) (2). The latter affliction appears within a day or two after the contamination of the water supply, and the typhoid fever follows after its incubation period. It is generally held that the early enteritis renders the individual more liable to develop typhoid fever (2) (3), although very few of the epidemiological reports definitely state whether the typhoid patients did suffer from the early disturbance (4). The opposite view, that the gastro-enteritis is a protective mechanism which helps to save the individual from typhoid infection, has also its supporters (5). The present report provides additional evidence in favour of the latter hypothesis.

First Investigation—A Case of Paratyphoid Fever and Eight Boys Exposed †

A boy suffering from paratyphoid fever was admitted to the hospital and it was learned from his parents that he and eight other boys had gone on a picnic 11 days previously. During this afternoon and evening all the boys had drunk the unboiled water of a small stream.

Patient's History—McC., age 11 years. Was perfectly well for 2 weeks, when he vomited and became feverish. During the first two weeks of the disease his fever was high. Lower degrees of hyperpyrexia were present for about three weeks more and the patient was in hospital for 5 weeks. B. paratyphosus β was isolated from his blood and he showed a positive Widal reaction with this organism, complete with 1 in 320 and partial with 1 in 640. This boy was apparently a healthy lad and was better cared for than most of his companions.

History of the Eight Boys Similarly Exposed

The other boys were interviewed individually and, without suggestion on the part of the author, volunteered the following information.

Boy 1. P.L. On the day following the picnic he felt all right but had no bowel movement, which was unusual for him. The next day he again had no bowel movement, but he went to school in the morning feeling well. When he came home from school he said that he had a pain in his stomach and did not eat any supper. A doctor was called who prescribed castor oil, and the boy was better the next day.

Boy 2. S.P. This boy had nausea and vomiting on the next day. His bowels moved once before the vomiting began and he was then given castor oil.

Boy 3. C.H. This boy had vomiting and diarrhoea for two days after the picnic.

Boy 4. J.L. This lad felt sick on the day following the picnic and had a "stomach ache".

Boy 5. E.H. He felt sick the following day (Sunday), and was afraid he was going to vomit in church, although he did not do so. He had no bowel movement that day. He felt well again on Monday.

Boy 6. A.F. This boy felt all right on Sunday but vomited three times on the way

*From the Wards and Laboratories of the Hospital for Sick Children and the Department of Paediatrics, University of Toronto, under the direction of Alan Brown, M.D., F.R.C.P.(C).

†*A rather similar incident, although involving typhoid fever, has been reported in the literature, but the reference unfortunately could not be found.*

home from school on Monday. On Tuesday he had a headache and felt feverish and lay on a couch most of the day. He says that his bowels were as usual and that he had two or three movements each day. He felt fine on Wednesday. This boy's mother stated that the symptoms were not as severe as the boy claimed. The boy was of a decidedly nervous temperament.

Boy 7. D.F. This boy had vomiting, anorexia and constipation about 48 hours after the picnic.

Boy 8. H.P. This boy stubbed his toe badly early in the day. He was very tired and flushed when he got home. He woke in the night, vomited and complained of pain in his toe. The toe was swollen and sore on the next day, Sunday. He was tired, listless, and not hungry on Sunday and Monday. On Monday a doctor opened the toe, which was swollen considerably, and a piece of wood was taken out of the wound several days later.

Comment

All of the boys, with the exception of the boy who later developed paratyphoid fever, showed some gastro-intestinal disturbance within forty-eight hours after drinking the creek water. Two of them had very slight symptoms which were, however, quite definite. Two of the boys were given purges which may have had the same beneficial effect as the diarrhoea that occurred naturally in several of the others.

The organism that was isolated from the patient was identified by the hospital bacteriologist as B. paratyphosus β, being motile and producing acid and gas in dextrose, mannite and maltose, but not fermenting lactose and saccharose. The strain was unfortunately discarded before we thought of having it typed according to the Kauffmann-White schema (6). These sugar reactions would not differentiate this organism from B. aertrycke. It is possible that the patient was suffering from a prolonged septicaemia caused by B. aertrycke, although such a disease occurs very rarely (7). In that event the immediate reactions in the other boys were mild cases of food-poisoning. Even though this less likely interpretation is adopted, the fact still remains that the boy who came down with the prolonged disease did not suffer from any immediate gastro-intestinal disturbances whereas his companions who escaped the serious disease were all afflicted with these slight early symptoms.

SECOND INVESTIGATION—A CASE OF TYPHOID FEVER IN A FAMILY OF SEVEN MEMBERS

A ten year old boy was admitted to the hospital with typhoid fever and from the mother we learned that other members of the family had suffered from diarrhoea some eight days before.

Patient's History—J.M. motored with the rest of his family to visit some relatives on a farm. When they arrived there, they found that the farmer's wife had been ill for about 12 days with weakness, depression and diarrhoea. The patient's mother, as well as looking after her own children, assisted in the care of this woman and noted that she passed loose stools flecked with blood. There were no sanitary facilities on the farm. The case was later diagnosed as typhoid fever by a positive Widal test and the further course of the disease.

The patient (J.M.) had no symptoms until ten days after the beginning of the visit, when he developed typhoid fever. On the tenth day of his illness he showed a positive Widal reaction with B. typhosus in a dilution of 1 in 160. The clinical course was typical and the patient was in hospital for five weeks. The mother stated that the patient was a particularly healthy boy and was much less easily upset than his 8 year old brother.

History of the Other Members of the Family

M.M., 8 years old, developed weakness, feverishness, vomiting and greenish diarrhoea two days after their arrival. These symptoms, with the exception of the vomiting, which occurred at intervals, kept up for six days. On the seventh day he felt perfectly recovered.

R.M., 4 years old, developed diarrhoea and vomiting three days after reaching there. His stools showed little flecks of blood and mucous and he was sick for two days, during which time he vomited three or four times.

N.M., 7 years old, showed symptoms seven days after their arrival. She vomited once, felt dizzy, appeared feverish, had blood-shot eyes and ate very little for two days.

Mrs. M., who was an intelligent woman, reported that three days after reaching there she had two slightly loose urgent movements per day for several days and, although she was hungry, when she started to eat she felt definitely nauseated. She normally tended to be constipated and never had more than one evacuation daily.

Baby, 9 months of age, showed no unusual symptoms.

Mr. M. showed no symptoms. He reported that he had had typhoid fever about thirty years ago.

About six weeks after the exposure, blood was taken from *M.M.*, *R.M.*, *N.M.* and *Mrs. M.* and the serum was set against two strains of B. typhosus (Rawlings and a local strain) with entirely negative results.

Comment

In this case the patient was probably infected by direct contact or from the water supply and the other members of the family were similarly exposed. Soon after the exposure four of the family suffered from gastro-intestinal disturbances, although in the case of the mother these were very mild. The infant, whose water and utensils were boiled, escaped unharmed. The father, who had had typhoid previously, did not suffer any illness. The patient himself showed no gastro-enteritis prior to the onset of the disease.

THIRD INVESTIGATION—TYPHOID FEVER OUTBREAK

Eleven city children who had attended a Sunday School picnic in a village park developed typhoid fever. Only one or possibly two of the patients had any upset before the onset of the disease. The one exhibiting definite symptoms had diarrhoea and vomiting two days after exposure, lasting for a day. Clinically he was less ill than most of the others. The other had no upset within the first 24 hours. She then spent the day at another large picnic where she ate no regular meals but a succession of ice creams, weiners, etc. The next morning, that is about 40 hours after the first picnic, she had some diarrhoea and vomiting, but as the child was subject to such upsets, these symptoms, which were rather slight, cannot be definitely attributed to the picnic that was responsible for the typhoid. The course of her disease was very severe and was probably complicated by a severe chill following a cold swim during the first days of her illness.

All the cases showed either positive Widal reactions or positive cultures for B. typhosus or both. Three of these cultures were typed serologically and were reported to have the reactions of true B. typhosus. Unfortunately the extensive investigations which have been carried out by the epidemiologists have not as yet disclosed how these children became infected.

History of Other Children Who Attended the Picnic

Seventy-five children, who did not develop typhoid fever, answered questionnaires. Of the seventy-five, twenty-two reported that shortly after the picnic they were seized with some or all of the following symptoms: diarrhoea, nausea, vomiting, and abdominal pain. Occasionally headache and fever were also present. A few were stricken the night of the picnic, a few did not show symptoms until forty-eight hours after the outing, but the majority became ill the day after it. The upset usually lasted two or three days, although a few older children recovered after one day and a few were sick for from four to seven days.

Comment

A larger percentage (30 per cent) of the children that did not develop typhoid showed these "immediate" gastro-intestinal disturbances than of those that did develop the disease (9 per cent or possibly 18 per cent). In calculating the 30 per cent in the non-typhoid group, it was assumed that all the children ate the contaminated material. It is quite possible that they all did not do so, in which event the percentage of intestinal disturbances among the children who ate the polluted food would be higher. Even as it stands the evidence is definitely against the theory that the early gastro-intestinal disturbances predispose to typhoid.

DISCUSSION

Although the correlation is not perfect, and considering the multitude of factors involved one would not expect it to be so, it would appear that the children which show the immediate reaction rarely if ever develop typhoid and vice versa, that those that come down with typhoid do not as a rule suffer from any upset soon after the ingestion of the causative agent. The early reaction may be caused by some slightly pathogenic faecal bacteria or some non-bacterial factor, or possibly by the typhoid or paratyphoid bacillus. If we presume that the faecal bacteria are responsible for it, we are then at a loss to explain why the patients who later developed paratyphoid or typhoid fever did not show the immediate upset as well, because we can hardly conceive of their being infected with B. typhosus and not the other faecal bacteria at the same time. However, susceptibility in these cases may be due to the fact that their intestinal mucous membrane does not respond easily to irritation. In the first two investigations it is interesting to note that the children who developed the major disease were particularly healthy boys. This type of individual who, perhaps because of his healthiness, does not readily react to irritation may permit the invasion and subsequent incubation of the disease.

Although the typhoid bacillus has certainly not been proved to be the causative agent of the gastro-enteritis, some observations arising from this study suggest that this may be the case. For example, as a general rule the immediate reactions in the first series, where the exposure was to B. paratyphosus β, were less severe than in the second and third series where it was a question of B. typhosus. This would be expected if these reactions were caused by these pathogens, as of course the latter organism usually causes a much more severe type of disease than the former. Teale (5) in a recent article has suggested that these transient upsets may be due to local irritation of the intestines by B. typhosus. It is interesting to remember also that when Pettenkofer (8) drank a large number of cholera organisms transient diarrhoea was the only result.

SUMMARY

1. Of a group of nine boys who drank unboiled river water, eight developed gastro-intestinal disturbances within 48 hours; the ninth did not show any early reaction but developed paratyphoid fever seven days later.

2. Of a family of seven who were exposed to a case of typhoid fever, four showed early gastro-intestinal disturbances, one showed no ill effects but had had typhoid previously, and one had no early upset but developed typhoid ten days later. The seventh member of the family, an infant, showed no symptoms.

3. Of a large group of children, an unknown number of whom were exposed to infection with B. typhosus, about 30 per cent developed gastro-intestinal disturbances within 48 hours after exposure. Eleven of the children developed typhoid fever and only one or possibly two of these showed any early reaction after exposure.

4. It is possible that the immediate

gastro-intestinal reaction prevents the typhoid bacilli from invading and setting up a severe infection.

The author is much indebted to Dr. W. L. Holman for suggesting this investigation and for his most valuable help and advice.

BIBLIOGRAPHY

1. FitzGerald, J. G., Practice of Preventive Medicine, Mosby, 1922, p. 139.
Sears, F. W., *Am. J. Pub. Health*, 1931, *21*: 1019.
2. Jürgens, *Med. Klin.*, 1927, *23*: 1012.
3. Halliday, et al., *J. Prev. Med.*, 1928, 98: 49.
4. Bracken, et al., *J. Inf. Dis.*, 1911, *9*: 410.
Jordan, et al., *J. Inf. Dis.*, 1912, *11*: 21, and 1913, *13*: 16.
J.A.M.A., 1934, *103*: 116.
U.S. Pub. Health Rep., 1935, *50*: 778.
5. Reed, et al., Report on Typhoid Fever in Spanish War, 1904, *1*: 675.
Coleman, W., Typhoid Fever, Nelson's L.L.Med., vol. 1, page 148.
Teale, F. H., *J. Path. & Bact.*, 1934, *39*: 391.
6. *J. Hyg.*, 1934, *34*: 333.
7. *J. Hyg.*, 1933, *33*: 224.
8. *Münch. med. Abhandl.*, 1892, *29*: 807.

EPIDEMIOLOGY AND VITAL STATISTICS

ENDEMIC INDEX FOR DIPHTHERIA, SCARLET FEVER, MEASLES AND WHOOPING COUGH IN THE PROVINCES OF CANADA AND MORBIDITY RATES, JULY TO DECEMBER, 1935

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IT is important that the health officer should know not only the present incidence of the communicable diseases but also whether such incidence is above the average for past years. In small centres direct reference to the records of former years is possible and comparison can be made with the corresponding periods. In provincial departments of health and in the larger cities it has been found desirable to represent in one figure the previous experience of the same month or week for a period of years. Such monthly or weekly figures are spoken of as the "endemic index" and a comparison of the present incidence with this index will show whether such incidence is above or below the average.

For the purpose of comparing the reported incidence of diphtheria, scarlet fever, measles, and whooping cough in the various provinces, the JOURNAL has published at intervals in the past two years the monthly morbidity rates for each of these diseases and presented the endemic index in each instance. The method used in computing the index and the limitations of such an index were given in an article in the JOURNAL of May, 1934. The rates as published here are for the six months July to December, 1935.

Diphtheria.—In six of the provinces the rate was below the endemic index. In New Brunswick it was above in October, November and December. In Nova Scotia it was above in July and September.

Scarlet Fever.—The incidence was below the index in New Brunswick except in July, very slightly above in Nova Scotia except in November, above in British Columbia in four of the six months, and above in three and below in three months in Saskatchewan. In the other four provinces it was above the index in practically all of the six months.

Whooping Cough.—In Saskatchewan, Ontario, New Brunswick, and Nova Scotia the reported incidence was above the average. In Alberta and Quebec it was below the average

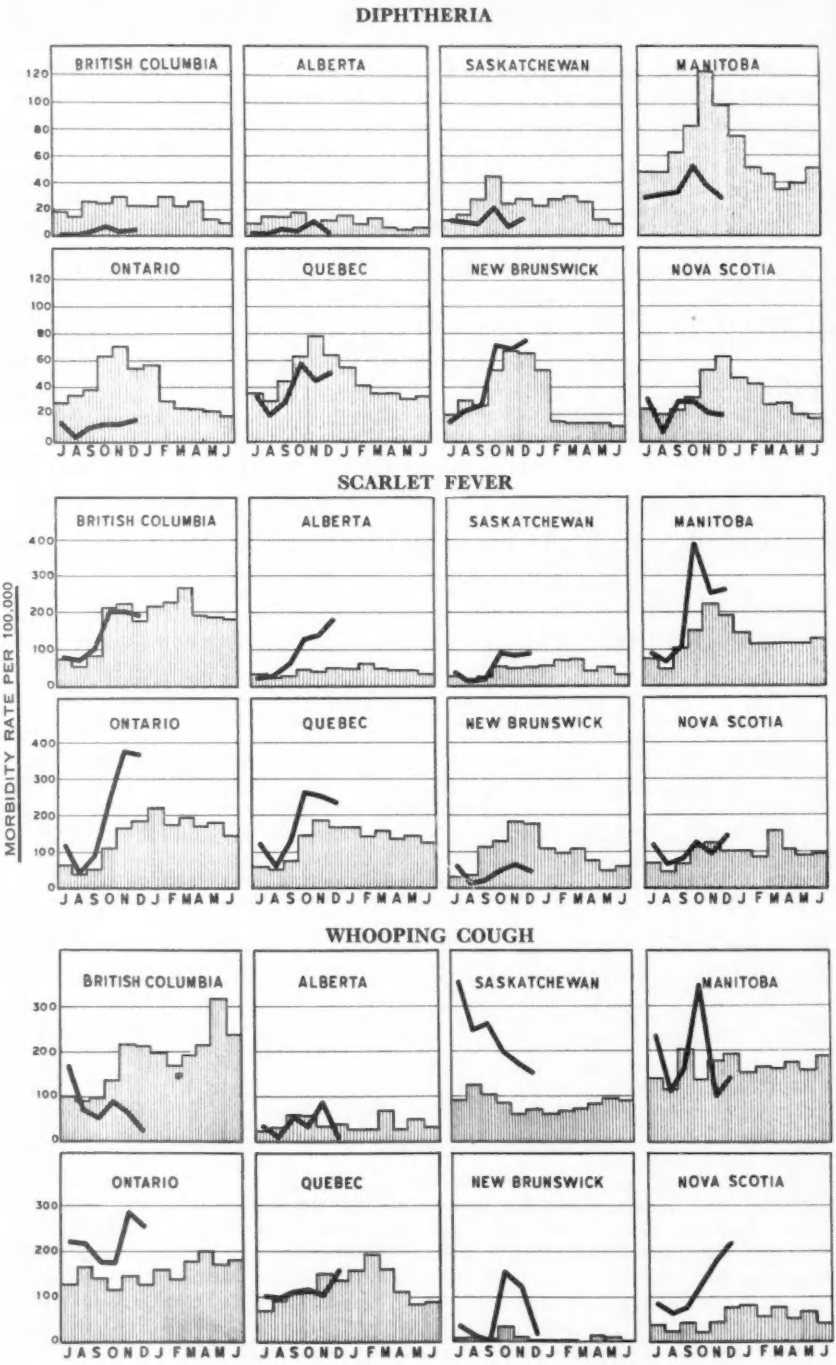

Figure I.—Monthly morbidity rates, July to December, 1935, for eight provinces of Canada, with the endemic index. The morbidity rate is represented by the black line and the endemic index as the shaded bars.

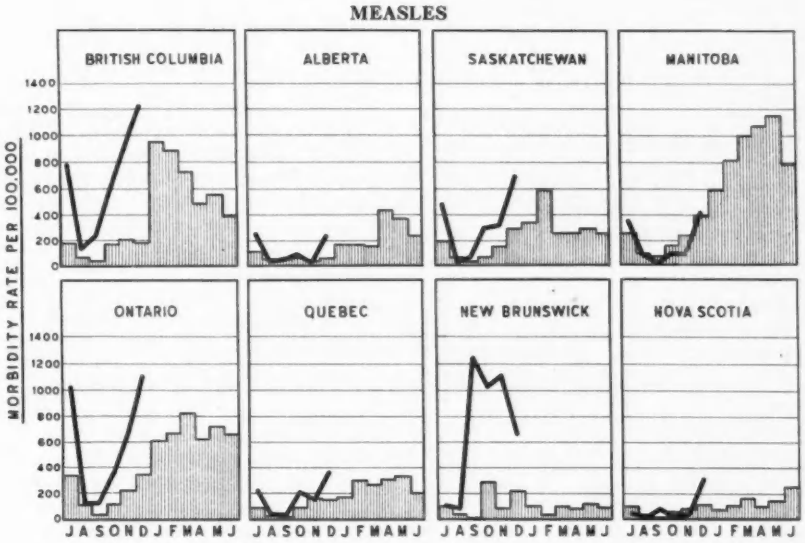

Figure II.—Monthly morbidity rates, July to December, 1935, for eight provinces of Canada, with the endemic index. The morbidity rate is represented by the black line and the endemic index as the shaded bars.

in four months. In British Columbia it was above in July and in Manitoba in July and October.

Measles.—In practically every month the rates were higher than the average in British Columbia, Alberta, Saskatchewan, Ontario, New Brunswick, and Quebec, and lower in Manitoba and Nova Scotia.

It should be recognized, of course, that the proportion of cases reported in each of these diseases varies greatly in the different provinces. Any comparison of the incidence between different provinces must be made only with due consideration of this fact.

REPORTED CASES OF CERTAIN COMMUNICABLE DISEASES IN CANADA* BY PROVINCES—NOVEMBER, 1935

Diseases	P.E.I.	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Diphtheria	2	9	24	109	38	22	5	7	2
Scarlet Fever	—	40	23	639	1117	154	66	85	121
Measles	6	16	392	410	1947	46	250	77	567
Whooping Cough	—	78	45	261	852	58	140	57	38
German Measles	—	1	—	256	337	2	162	13	113
Mumps	—	84	—	112	1357	355	2446	19	294
Smallpox	—	—	—	—	—	—	2	1	1
Cerebrospinal Meningitis	—	—	1	1	6	—	—	—	—
Anterior Poliomyelitis	—	—	1	2	8	—	4	3	1
Typhoid Fever	—	3	8	104	16	9	3	—	3
Trachoma	—	—	—	—	—	—	1	—	9

*Data furnished by the Dominion Bureau of Statistics, Ottawa.

ASSOCIATION NEWS

Dr. FitzGerald Honoured

DR. J. G. FITZGERALD, First Vice-President of the Association and Director of the School of Hygiene and Connaught Laboratories, University of Toronto, was again honoured recently. Having previously served as a Scientific Director of the International Health Division of the Rockefeller Foundation and as Chairman during the last year of his term of appointment, which ended in 1934, he has been reappointed as a Scientific Director. Announcement has been made also of his appointment as a member of the Permanent Commission on Biological Standardization of the Health Organisation of the League of Nations.

Appointment of Dr. Phair as Chief Health Officer

DR. J. T. PHAIR, General Secretary of the Association, has been appointed Chief Medical Officer of Health for the Province of Ontario. He will continue to serve also as Director of the Division of Maternal and Child Hygiene.

The Laboratory Section Meeting

THE fourth annual Christmas meeting of the Laboratory Section was held in the Royal York Hotel, Toronto, on December 30th and 31st, 1935, under the chairmanship of Dr. W. J. Deadman. The attendance of more than ninety members indicates that such a meeting is offering a definite opportunity to those who are interested in bacteriology, pathology, and chemistry to present new work in these fields. The meeting gives the opportunity also for a discussion of the findings of various committees of the Section whose studies have a practical bearing on the everyday work of the members. Among the important committees of the Section are the committee on standard methods with appropriate sub-committees; the committee on the publication of recommended laboratory procedures for which no standard methods have been established; the committee on diagnostic outfits, and the committee on the directory of laboratory personnel in Canada.

In all, sixteen papers and a series of five demonstrations were presented. At the evening session Dr. Robert S. Breed, of the New York State Agricultural Experiment Station, Geneva, discussed recent improvements in the methods for the examination of milk. At the luncheon session the Honourable J. A. Faulkner, M.D., Minister of Health of Ontario, stressed the increasing importance to physicians of laboratory services, indicating the phenomenal increase in the number of specimens examined in the Provincial Laboratories in Ontario. Professor G. B. Reed of Queen's University, recently returned from a visit to Russia, gave a survey of the socialization of medicine and public health in the Soviet Union. Dr. G. W. Rake of the Rockefeller Institute for Medical Research, New York, discussed the epidemiology of meningococcus meningitis, presenting the results of his investigations which elucidate the role of carriers in the transmission of this disease. Dr. J. G. FitzGerald presented the subject of diphtheria prevention, indicating the place of the Schick test, the necessity of a proper toxin and control, the extent of the use of diphtheria toxoid in the various provinces, and the established value of the present method of immunizing, namely the administration of three doses of toxoid. Emphasis was laid on the fact that physicians should not overlook the possibility of clinical diphtheria in an immunized child. Active steps were taken by the Section to make possible, through the co-operation of the directors of various laboratories throughout Canada, an inten-

sive study of the Kauffmann-White classification of Salmonella. Important findings were presented concerning the incidence of Salmonella paratyphi A and B. Arrangements were made for the trial of the complement fixation test in smallpox in the various provincial laboratories. The first bulletin presenting new laboratory procedures which have been recommended for trial by the Section was distributed to the members. These procedures included cultural method for the primary isolation of *M. tuberculosis*, the virulence test for *Corynebacterium diphtheriae*, method of drying complement for use in serology, typing of the pneumococcus using the Neufeld reaction, and dark field examination of chancre fluid and the use of the combined outfit. It is purposed to publish further outlines as new procedures are recommended.

The importance of the meeting is indicated by the attendance of members from Vancouver, Winnipeg, Halifax, Saint John, Quebec, Montreal, Hull, Ottawa, Kingston, Peterborough, Guelph, London, Sault Ste. Marie, North Bay, Hamilton, St. Catharines, and other centres.

The following officers were elected for 1936: Chairman, Dr. J. H. Orr, Kingston; Vice-Chairman, Dr. A. J. Slack, London; Secretary, Dr. G. D. W. Cameron, Toronto; Section Council, Dr. D. T. Fraser, Toronto, Dr. M. H. Brown, Toronto, and Dr. W. J. Deadman, Hamilton.

THE COMING VANCOUVER MEETING

THE twenty-fifth annual meeting of the Association will be held in Vancouver during the week of June 22nd in conjunction with the meetings of the Western Branch of the American Public Health Association, the State and Provincial Health Authorities of North America, and the Canadian Tuberculosis Association. The credit for the successful completion of the plans for this outstanding meeting is due to Dr. H. E. Young, Provincial Health Officer, who is President of both the Western Branch of the American Public Health Association and the State and Provincial Health Authorities, and Dr. J. W. McIntosh, Medical Health Officer of the City of Vancouver and President of the Canadian Public Health Association.

Vancouver is holding a commemorative year and the invitation to share in the celebrations has been accepted by a number of national agencies. The headquarters for the meeting will be Hotel Vancouver. The dates selected will make it possible for the members of the Canadian Nurses Association, who are holding their annual meeting in the following week, to attend the associations' meetings. They also permit members of the Council of the Canadian Medical Association, the annual meeting of which is being held in Victoria during the same week, to attend the Council meetings and to share their attendance with the other associations during the remaining days of the week. It was with great difficulty that the committee in Vancouver in charge of the Vancouver celebration arranged for the number of conventions which were planned for the latter part of June. It is possible also that the Dominion Council of Health meeting, which is usually convened in June in Ottawa, will be held in Vancouver this year. At the conclusion of the meetings proper the several associations will meet in Victoria on Saturday, June 27th, joining with the members of the Canadian Medical Association in a special program.

CERTIFICATION OF SANITARY INSPECTORS

THE first examinations to be held by the Association for the certification of sanitary inspectors in Canada were conducted on December 11th, 12th, and 13th in three provincial centres, namely Vancouver, Toronto, and Halifax. As it was desired to hold the first examinations before the close of the year, extended notice was not possible and in con-

sequence only a small number of candidates were prepared to make application. Under the provisions relating to the certificate, applicants holding acceptable qualifications as issued by the Royal Sanitary Institute and certain other bodies may be granted the certificate without examination. Applications for the certificate under these conditions have been made by five inspectors, while five sat for the examinations. The report of the Examining Board will be published in the February issue.

After careful consideration of the various times for conducting the annual examinations it has been decided to hold the 1936 examinations in September. Instruction is being provided in a number of departments of health. The members of the Committee are pleased with the excellent progress which has been made and anticipate that a considerable number of candidates will make application for the next examinations. It is realized, of course, that several years must elapse before the examinations will become established and the value of the certificate appreciated. Every assistance is being extended to the Association by the Canadian Institute of Sanitary Inspectors, who are duly represented on the National Committee and on the Central Board of Registration and Examination.

SANITARY INSPECTORS EXAMINATIONS 1935

AS has already been expressed by the Committee on the Certification of Sanitary Inspectors in the Regulations and Syllabus, the examinations are designed to permit the certifying of suitable inspectors who are qualified by experience and who have acquired an adequate knowledge of the subjects which are fundamental in the proper conduct of their work.

The examinations require the preparation of a report of a field investigation conducted at the time of the examination; an interview constituting an oral examination by the Provincial Board of Examiners, which consists of the chairman, a sanitary inspector and, if possible, a sanitary engineer; and three written papers. In this way the candidate has an ample opportunity to present evidence of his fitness for the certificate.

In view of the interest attaching to the holding of the first examinations, the 1935 examination papers are presented.

FOOD CONTROL AND LEGISLATION

Time: 3 *hours*

1. Describe the features to be noted in the inspection of a milk pasteurization plant and indicate the importance of each in rendering milk safe for human consumption.

2. (*a*) To what points would you direct your attention in the inspection of a bakeshop?

(*b*) In what ways may food cause illness? Illustrate your answer by examples.

3. Write notes on:

(*a*) Safe dish-washing in a restaurant.

(*b*) Composition of cow's milk.

(*c*) Essentials of a "milk house".

(*d*) Bottle-washing in a soft drink plant.

4. (*a*) What are the essentials of a satisfactory slaughter house?

(*b*) What are the characteristic features of sound beef?

(*c*) What action would you take on finding a portion of unsound or diseased meat in a retail store?

5. Under what enactments does the sanitary inspector carry out his duties in the province in which you reside?

PREVENTION AND CONTROL OF COMMUNICABLE DISEASES AND RELATED SUBJECTS

Time: 3 *hours*

1. (*a*) How are communicable diseases commonly spread? Illustrate your answer by examples.

(*b*) By what means may the incidence of smallpox, typhoid fever, and tuberculosis be most effectively reduced in any large community?

2. Why has complete control of communicable disease not been accomplished through isolation and quarantine? Discuss the part to be played by the sanitary inspector in the control of communicable diseases.

3. Explain the following terms as they apply to smallpox:

(*a*) Notification.
(*b*) Isolation.
(*c*) Quarantine.
(*d*) Terminal disinfection.

4. (*a*) Describe briefly the life history of the house fly.
(*b*) Outline the methods of control.
(*c*) What diseases may be spread by the house fly?

5. Write notes on:
(*a*) Control of bed bugs.
(*b*) Crude death rate.
(*c*) Droplet infection.
(*d*) Diphtheria toxoid.
(*e*) Carriers.

SANITATION

Time: 3 *hours*

1. Describe the sanitary facilities, including a safe water supply, which should be supplied for:
(*a*) A farm house.
(*b*) A lumber camp of 100 men.
(*c*) A rural school.

2. What, in your opinion, constitutes the important features of good housing? Enumerate the items to which you would pay special attention in making an inspection of a lodging house.

3. Outline the plumbing and drainage system of a dwelling, installed in accordance with local by-laws, illustrating with a sketch showing:
(*a*) Laundry tub in the cellar.
(*b*) Sink on the ground floor.
(*c*) Water-closet, bath, and wash-basin on the second floor.

4. How would you proceed to make a sanitary survey of a municipality and what information would you secure? Describe how this information could be presented intelligently to the officials of the municipality.

5. What are the constituents of refuse from a city? Describe the methods which may be employed in the disposal of refuse, mentioning advantages and disadvantages of each method.

BOOKS AND REPORTS

Modern Home Medical Adviser. *Edited by Morris Fishbein, M.D., Past President of the American Medical Association. Published by Doubleday, Doran & Company, Inc., New York. Distributors for Canada and Newfoundland, McAinsh & Co., Limited,* 388 *Yonge Street, Toronto.* 905 *pages, with illustrations. Price,* $7.50.

The Modern Home Medical Adviser is planned to serve three general purposes: to teach its readers what everyone should know about medicine and hygiene, to answer the questions which so frequently arise in the home when a family is confronted by the common diseases, and to serve as an adequate guide in hygiene, including prenatal care, care of the child, first aid, and many other matters concerning health. This volume therefore should serve to bridge effectively the gap between medical and public knowledge.

The introductory chapters on the choice of a physician and the family medicine chest bring out facts which are extremely helpful and constructive. In turn the subjects of first aid, sex hygiene, care of the mother before and after childbirth, and care of the infant are discussed. Communicable diseases and diseases of various body systems, respiratory, heart and circulation, etc., deficiency diseases, and general diseases such as cancer and diabetes are reviewed. Anatomical and physiological aspects of the various diseases are dealt with in their respective connections. Every phase of health interest is given consideration and the index is an ample guide to the 900 pages of this work. The numerous illustrations and diagrams presented in the text serve to impress the message which this book has for every family.

There are many things about this volume which distinguish it from the usual family medical book. It does not outline specific treatment for disease conditions but describes symptoms and signs of diseases in simple language so that recognition of trouble may serve to bring the patient to the doctor for early treatment. It is a unique volume, authoritative and comprehensive, helpful in every way and providing for the family sound health teaching. It is, however, true that as technical terms are not eliminated entirely the book must be in the hands of intelligent persons who will read it carefully if it is to fulfill its purpose.

Twenty-four medical men, specialists in their various fields, have collaborated in producing this important volume and Dr. Fishbein is to be congratulated not only on the chapters which he personally contributed but on the excellence of the whole work.

A. H. Sellers.

Public Health Administration in the United States. *Wilson G. Smillie, Professor of Public Health, Harvard School of Public Health. Published by the Macmillans in Canada at St. Martin's House, Toronto,* 1935. 458 *pages. Price* $4.20.

Although the title indicates that the author presents the organization and functioning of the public health services of the various divisions of government in the United States, students of public health in Canada and other countries will find that it is a presentation of the basic essential health functions common to all countries. Within the compass of a book of 458 pages the author has succeeded in providing an admirable outline of these basic health activities, indicating in succeeding sections of the book the organization of public health programs in municipal and state organizations and in the federal government.

Of fundamental importance is the proper conception of the functions of a health organization. Having laid this foundation, Dr. Smillie considers in detail the administrative control of communicable diseases, discussing the epidemiology and control of the more common diseases. This section of 125 pages is an outstanding feature of the volume. Municipal health administration, rural health, and state and federal administration are presented, followed by helpful chapters on voluntary health organizations, disaster relief, the practising physician, appraisal of health activities, and budgets. The author has been most successful in compiling the material so as to show the proper correlation of the various activities, a relationship which is so essential in any effective plan of health promotion and protection.

The book meets a very definite need and will be greatly appreciated by all students of public health.

R. D. Defries.

Agents of Disease and Host Resistance. *Frederick P. Gay and Associates in the Department of Bacteriology, College of Physicians and Surgeons, Columbia University, New York. Published by Charles C. Thomas,* 220 *East Monroe Street, Springfield, Illinois,* 1935. 1581 *pages. Price* $10.00.

This book might well have been entitled "The Etiology of Disease" inasmuch as the work includes the principles of immunology, bacteriology, mycology, protozoology, and virus diseases. It is one of the most comprehensive works of its kind that this reviewer has seen and comprises over 1500 pages. It is clearly set out in the preface that "the era of the one-man textbook" is gone and such a distinguished list of associate authors is convincing evidence of the completeness of the work.

The book is arranged in twelve parts presenting the subject matter as follows: (1) the general aspects of the causation, classification and nature of disease; (2) inanimate disease agents and tolerance; (3) living disease agents, particularly bacteria; (4) infection and epidemiology; (5) resistance and immunity; and (6) pathogenic bacteria and diseases produced by them. In this latter section the various groups of bacteria are dealt with in a systematic way and in a very detailed fashion. In the remaining sections there are discussed in turn the pathogenic spirochaetes, pathogenic fungi and fungus diseases, indeterminate pathogenic forms and diseases produced by them, including rickettsia and filterable viruses, the protozoa and helminths, and finally diseases of obscure etiology, including such conditions as acute mononucleosis, erythema, nodosum, malignant tumours, adrenal diseases, etc. The volume concludes with a résumé of the practical results in the diagnosis, prevention, and cure of infectious diseases.

Each section is profusely and excellently illustrated and supplemented by representative references. In this way the reader may have access to a very extensive bibliography. It contains, however, very little detailed information as to the technique of the laboratory procedures with which it deals, but this aspect is obviously beyond the scope of the text. One may justly state that it is a monumental work and is quite distinct from the usual type of text-book, being encyclopaedic in nature. The undergraduate will find in this book one of the most comprehensive treatments of the etiology of disease available. Its chief service will be to the advanced worker and should be of great value.

M. H. Brown.

Tuberculosis. *Number* 4 *in the WHAT YOU SHOULD KNOW ABOUT series. Health Service of the Canadian Medical Association. Sponsored by Life Insurance Companies in Canada. Edited by Grant Fleming. Published by the Macmillan Company of Canada, Limited, St. Martin's House, Toronto,* 1935. 49 *pages. Price* 35c.

The control of tuberculosis depends in large measure upon health education. This little book has been prepared with this fact in mind and it gives concisely the essential facts about tuberculosis. Laymen will have

no difficulty in grasping the ideas presented because the message which the text has to give is expressed in simple terms and in most readable form.

In the introduction a few landmarks in the history of tuberculosis are recounted. Brief discussions of the nature of the disease, the causative agent, modes of infection and methods of transmission, provide a working knowledge for the reader. The early signs and symptoms of tuberculosis are indicated and emphasis is laid on the extreme importance of early diagnosis. A short résumé of tuberculosis statistics serves to emphasize the importance of the problem and to show the characteristic age and sex incidence of the disease. Later pages deal with treatment and prognosis, and include notes on the purpose and value of the sanatoria. The book closes with the message of prevention, particularly in reference to contacts of tuberculosis persons, and issues a stimulating challenge for greater effort in the control of this great health problem.

This small volume will be one of great service. It may be read with profit by any person and it is particularly valuable as a book which may be recommended by medical practitioners to their patients.

K. F. Brandon.

New and Supplementary Facts and Figures about Tuberculosis. *Compiled by Jessamine S. Whitney, Statistician, National Tuberculosis Association, 50 West 50th Street, New York City,* 1935. 46 *pages. Price* 50c.

"New and Supplementary Facts and Figures about Tuberculosis" now makes available more recent and revised vital facts of intimate concern to those interested in either the preventive or the curative aspects of the disease and brings the data previously compiled by the author up to date. A chapter dealing with tuberculosis infection deserves special mention. Data from nine of the most important studies made concerning tuberculosis infection are summarized and the various analyses made are presented in a group of tables.

The statistical data are presented in a series of 60 tables which illustrate the decline in total tuberculosis mortality, death rates by sex and age, death rates by colour, the relation of tuberculosis to other important causes of sickness and death, sanatorium facilities, stage of disease on admission to institutions, nursing services, etc. With the exception of the data on tuberculosis infection no comment is included, the purpose of the publication being to provide answers to questions by making available the necessary facts.

All students taking post-graduate courses in public health should peruse this material with great care and the original papers referred to in the text should be consulted. Everyone in the field of tuberculosis as well will find that this publication is a concentrated source of data on the tuberculosis problem. An index to all statistical tables is provided and the tables are numbered to correspond with those in the earlier publication.

A. H. Sellers.

Report of the Department of Health for the City of Hamilton for the Years Ending October 13, 1933, and October 31, 1934. *James Roberts, M.D., Medical Officer of Health, Hamilton.* 93 *pages.*

The report of the health department of the city of Hamilton is introduced by the statement of Dr. James Roberts, the medical officer of health. Dr. Roberts briefly reviews the activities of the period covered by the report under the main divisions into which the department has been divided: administration including vital statistics, preventable disease control, medical services, sanitary inspection, and laboratory services. The organization of the health department and the relationship of each unit to the rest of the department are illustrated by a diagram. The reports of the various divisions then follow in turn.

Hamilton has an enviable health record. The general death rate itself, 9.0 per 1,000 population for the year ending October 1934, is an extremely low one for an urban municipality of 154,000 population. The infant death rate for 1933 was 52 per 1,000 live births, 23 per cent of these being attributed to prematurity and 23 per cent to pneumonia. The tuberculosis death rate was only 36 per 100,000 for the later year presented. Perhaps more striking than anything else in the Hamilton health report is the city's record in regard to diphtheria. There were no cases for a year for the first time in the city's history and no deaths for four years in succession—a remarkable achievement.

The extensive activities of the health service and the response of the citizens are indicated in the table on page 23 giving the attendance at various clinics during the later year covered by the report—viz., child welfare clinic, 27,373; diphtheria immunization clinic, 12,735; prenatal clinic, 3,549; etc. Some 50,000 preschool and school children have been immunized against diphtheria since 1922. These facts bear a striking

tribute to the work of Dr. Roberts and his colleagues.

The inclusion of a summary clinic timetable gives the reader a clear idea of the distribution of preventive services in this municipality. A financial statement completes the report. *A. H. Sellers.*

Statistical Review. *A bulletin of the Department of Public Health, City of Toronto. Gordon P. Jackson, M.B., D.P.H., Medical Officer of Health,* 1934. 25 *pages.*

This bulletin is the first of its kind published by the department of health for the city of Toronto and it serves to supplement the monthly statements which are now issued. A concise review of the vital facts for this large urban municipality for 1934 is given and the data of the four previous years are included for comparison.

In 1934 the population of Toronto was 629,285 and the general death rate 10.1 per 100,000,—the lowest ever recorded. Corrected for residence, this rate would be 6 per cent lower, or about 9.5. The crude birth rate, too, was the lowest on record—17.0 for 1,000 population, and when corrected for residence it would be 10 per cent lower.

A table of chief causes of death for a 5-year period indicates the increasing proportion of deaths from cardiovascular-renal conditions and apoplexy, cancer, and diabetes. Data on the percentage distribution of deaths by age show that in 1910, 27.5 per cent occurred under 1 year of age, while less than one-third of that proportion now occur there. Similar reductions have also occurred at all ages under 40 years. It is well to keep in mind that, while such comparisons are of some interest, only age specific death rates can afford a sound comparison in this respect.

A large section of the bulletin is devoted to data on communicable diseases. During 1934 not one death was recorded from diphtheria, and from available information it appears that Toronto is the first city of its size to enjoy this happy experience. Up to the end of 1934 no death had occurred among over 100,000 Toronto children completely immunized. Not only that, but in 1934 the reported cases of diphtheria were "less than one-third of the deaths of 5 years ago." A series of tables gives cases, deaths, and their respective rates for a 5-year period for diphtheria, measles, typhoid fever, smallpox, whooping cough, scarlet fever, and poliomyelitis.

In 1934 the death rate for tuberculosis reached the low level of 41 per 100,000—again the lowest recorded (including deaths of Toronto residents in sanatoria situated outside the city). The infant mortality in 1934, too, was by far the lowest ever experienced—54 per 1,000 live births, a decline of 16 per cent over the previous year. No reduction has occurred in infants under 1 week. Maternal mortality showed no significant decline. Among resident mothers, 40 per cent of the deaths were classed to abortion, three-quarters of which were self-induced. Twenty per cent were classed to puerperal sepsis (excluding abortion) and 17 per cent to puerperal toxaemias.

This report will provide those interested in health questions in Toronto with the essential facts and a birdseye view of the present status of the city in regard to major public health problems. It is to be hoped that this excellent bulletin will become an annual feature of departmental activity and will be followed by similar ones on medical school inspection, sanitary services, etc., or be replaced by a complete annual report covering all the phases of health activity undertaken by the department.

A. H. Sellers.

Canadian Cavalcade, 1920-1935. *A memorandum prepared for the consideration of the Board of Governors of the Canadian Welfare Council by the Executive Director, Miss Charlotte Whitton, C.B.E.,* 1935. 48 *pages. Price* 15 *cents.*

Canadian Cavalcade, a unique memorandum issued by the Canadian Welfare Council, passes in review the social and economic developments from the days immediately following the war to the present. During the last fifteen years far-reaching changes have occurred in all sections of the fabric of our national life. New concepts, new standards, and new attitudes have replaced those which served for decades. The post-war period with its disturbing problems laid great stress on existing institutions; and subsequent events have combined to promote more serious consideration of national and community problems.

The memorandum deals briefly with industrial reforms, housing, developments in technical education, delinquency and crime, immigration problems, drug and liquor traffic. The problems associated with children born out of wedlock, desertion, old age pensions, and public assistance, are also presented.

Canadian Cavalcade is recommended to every thoughtful Canadian for careful perusal and study.

A. H. Sellers.

CURRENT HEALTH LITERATURE

These abstracts are intended to direct attention to articles that have appeared in other journals during the past month. Any of the journals referred to may be borrowed for three days or longer if desired. Address requests to the secretary of the Editorial Board.

Is Cancer Mortality Increasing or Decreasing?

This critical presentation of data on the steady increase in the actual number of deaths from cancer points out that in many countries the cancer deaths exceed those from tuberculosis. This holds for Germany, Great Britain, Denmark, Holland, Switzerland, and Austria, whereas in Italy, France, Spain, Hungary, and Finland, the deaths from tuberculosis are still more numerous than those from cancer. The cancer death rates were standardized for age and it is shown that the change in the age constitution and in particular the increase in the numbers living at higher ages, have been responsible in the German-speaking countries for the increase in the crude rate of mortality from cancer. Also there is a steady movement in the age of death from cancer to older age groups. This definite transfer of deaths to a higher age class might be the result of modern therapy or owing to aging of population.

The age-standardized rates lead to the conclusion that the risk of dying from cancer is not increasing. It is said that an inhabitant of Berlin, aged 50, is not more likely to die of cancer before 60 than his father was; on the contrary, his real risk of dying from this cause is probably less.

George Wolff, J. Hyg., *35*: 327, 1935.

Rocky Mountain Spotted Fever in New York State Outside of New York City

Although Rocky Mountain spotted fever has for some years been known to occur in the eastern section of the United States, eastern cases have been reported infrequently in the literature. This brief paper which describes the symptomatology and serological reactions of 10 cases which occurred in New York State (excluding the City) from 1926 to 1934 is, therefore, of interest.

Blood sera from 8 of the 10 cases gave a marked agglutination reaction with *B. proteus* X 19 and two others a partial reaction. The observations made support the view that samples of blood taken at three stages of the infection should be examined. The clinical and epidemiological evidence suggested that the disease was Rocky Mountain spotted fever. In 9 out of 10 cases there was evidence of tick bite or definite contact with ticks before the onset of the illness. None could be associated with flea bites. The cases occurred in the late spring or summer of successive years and only in rural localities. The disease was of several weeks' duration and the mortality rate was 30 per cent.

E. R. Maillard and E. L. Hazen, Am. J. Pub. Health, *25*: 1015, 1935.

Active Immunization against Scarlet Fever

From 1926-29 all nurses and doctors at the Philadelphia Hospital for Contagious Diseases were given an immunizing course of 5 doses of Dick toxin. During this period no case of scarlet fever occurred in the personnel. In 1929 immunization of new personnel was dropped for a period of 14 months and 12 cases occurred in those not immunized. Since its reintroduction no further cases have developed.

From 1932-35 10,057 children between 1 and 16 years of age were Dick tested and the positives (about 42 per cent) were given the course of immunization. Re-Dick tests in 790 cases treated with 5 doses showed 98.5 per cent negative. A sixth dose to those remaining positive raised this to 99.75 per cent negative. Experience with the duration of immunity as evidenced by the Dick test was found to be very satisfactory. In a group found negative on re-Dick test after immunization, 3.1 per cent had become positive again in 2 years. The author concludes that proper care of the child for 6 hours after the injection by rest in bed and light diet is necessary to reduce reactions.

J. Norman Henry, J.A.M.A., *105*: 488, 1935.

Meningo-Encephalitis following Rubella

During the months of December, 1934, to February, 1935, St. Paul, Minn., experienced a widespread epidemic of German measles. The incidence among adults was especially high. The disease was mild at the onset of the epidemic but as it progressed increased clinical severity with unusual complications such as severe lymphadetis and purpura occurred. Two cases of rubella are reported in which meningo-encephalitis complicated the disease. One of these died and post-mortem examination confirmed the diagnosis. The

author mentions three other cases of meningo-encephalitis with recovery which occurred in this same epidemic of rubella.

S. F. Briggs, J. Pediat., 7: 585, 1935.

Maternity Nursing Service in a Health Unit

This article is one of a series on the health services provided by the Brunswick-Greensville rural health unit in southern Virginia. The area comprises two counties with a population of 34,000 of which 60 per cent is coloured. The personnel consists of one full-time medical officer of health, a sanitary officer, two nurses, one to each county, and one part-time office clerk. The area is rural with no hospitals and there are 18 general practising physicians residing there. Coloured midwives attend 75 per cent of all births in the two counties and 90 per cent of the coloured and 40 per cent of the white mothers were dependent upon the midwives for delivery care. A survey of 1,007 families revealed that 45 per cent of the maternity cases consulted a physician one or more times during pregnancy but two-thirds of these persons saw the physician only once. The nurses were urged to devote about one-third of their time to maternal hygiene. Actually 21 per cent of the nurses' visits were for maternity cases, or 234 out of 1,114 persons visited. Of those maternity cases visited, 22 per cent were seen both during pre- and post-partum periods. The appraisal form recommends five nursing visits during the ante-partum and three during the post-partum period. The average number of ante-partum visits in this unit was 1.7; the average post-partum visits, 1.4. In Rutherford county, Tennessee, the nurses gave advice and service to 29 per cent of all the maternity cases occurring within the county annually over a 5-year period. In Cattaraugaus county, New York, 29 per cent of the maternity cases received some service from the public health nurses during the study. In this health unit 22 per cent of the maternity cases received one or more visits. For maternal hygiene education the nurses concentrated on classes for mothers and supervision of the midwives.

Pearl McIver, U.S. Pub. Health, Rep., 1935, 50: 1923.

Cultivation of the Virus of Human Influenza

The growth and passage of influenza virus in both the developing egg and the minced chick-embryo Tyrode solution medium is described. There is a complete absence of specific lesions and the irregularity of growth in egg membranes makes this technique unsuitable for the study of this virus, especially as regards antibody titration. However, the successful cultivation in a simple medium of minced chick-embryo and Tyrode's solution raises the hope that this method will find some useful application. The antigenic properties of the culture strain are being investigated.

Wilson Smith, Br. J. Exper. Path, *16*: 508, 1935.

The Fate of Persons in Contact with Tuberculosis

This study is an analysis of the records of 1,000 families under observation in the outpatient clinic of the Henry Phipps Institute, Philadelphia. The results of exposure of persons of different ages are given. Among white persons first exposed between birth and nine years of age to tuberculosis cases disseminating the bacilli in the sputum, 9.92 per cent of those living from 12-14 years after the beginning of exposure have acquired tuberculosis. Among those exposed to cases in whose sputum no tubercle bacilli had been found the frequency of disease has been 1.97 per cent. In white persons first exposed to tuberculosis after 15 years of age the frequency of infection, like that of early childhood under corresponding conditions, increases rapidly and far exceeds that of the general population. Pulmonary tuberculosis of the adult type is found in patients of this group. This pulmonary tuberculosis is not a continuation of the tuberculosis of childhood but is an exogenous infection acquired in adolescence or adult life. Further evidence of the occurrence of exogenous infection in adult life is obtained by comparing mortality following exposure to tuberculosis with that of the general population. It increases continuously when exposure begins after 15 years of age, just as it does after exposure at an earlier age, and reaches a rate far in excess of the maximum death rate from tuberculosis in the general population. In both children and adults the frequency of infection is much greater in contacts of open tuberculosis than in contacts with cases in whose sputum tubercle bacilli have not been found. Because infection is exogenous, the severity of the disease in adolescents, adults and young children varies with the number of tubercle bacilli in the environment.

E. L. Opie, F. M. McPhedran, and P. Putnam, Am. J. Hyg., *22*: 644, 1935.